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PB-299 029

The Computation and Graphical Display of the NSF Water Quality Index from the STORET Data Base Using the Integrated Plotting Package. Program Documentation and Users Guide, 2nd Edition

(U.S.) Environmental Protection Agency, New York

Jun 78

PB 299029

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK. NEW YORK 10007

The Computation and Graphical Display of the NSF Water Quality Index from the STORET Data Base Using the Integrated Plotting Package

PROGRAM DOCUMENTATION AND USERS GUIDE

2nd Edition

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June 1978

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NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

BIBLIOGRAPHIC DATA SHEET

1. Report No. EPA/DF-79/007a
EPA-902/2-79-003

2.

3. Recipient's Accession No. PB299029

4. Title and Subtitle
The Computation and Graphical Display of the NSF Water Quality Index from the STORET Data Base Using the Integrated Plotting Package. 2nd Edition

5. Report Date
June 1978

6.

7. Author(s)
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8. Performing Organization Rept. No.

9. Performing Organization Name and Address
United States Environmental Protection Agency, Region II
Data Systems Branch
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New York, NY 10007

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. Sponsoring Organization Name and Address

13. Type of Report & Period Covered
Final

14.

15. Supplementary Notes
For magnetic tape see PB- 299 028

Reproduced from best available copy.

16. Abstracts

The NSF-Water Quality Index is a numerical expression which reflects the composite influence of nine physical, chemical, and bacteriological parameters to water quality. It was developed and has been widely field tested by the National Sanitation Foundation as a means for reporting the current status and trends of water quality. This Report documents the logic and operation of three computer programs developed to present this index in report and/or graphical form using the STORET Database as input and the graphics capability of the Integrated Plotting Package. Data from the Raritan Basin is presented as a test application.

17. Key Words and Document Analysis. 17a. Descriptors

* Water Quality Analysis, * Computer Model, information retrieval.

[illegible]entifiers/Open-Ended Terms

17c. COSATI Field/Group

18. Availability Statement
Release to Public

19. Security Class (This Report)
UNCLASSIFIED

20. Security Class (This Page
UNCLASSIFIED

21. No. of Pages
133

22. Price
A06-A01

FORM NTIS-35 (REV. 10-73) ENDORSED BY ANSI AND UNESCO. THIS FORM MAY BE REPRODUCED USCOMM-DC 8265-P74

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ABSTRACT

The NSF - Water Quality Index is a numerical expression which reflects the composite influence of nine physical, chemical and bacteriological parameters to water quality (1). It was developed and has been widely field tested by the National Sanitation Foundation as a means for reporting the current status and trends of water quality.

To address this need of analyzing and reporting trends in water quality a set of three computer programs have been developed to present this data in both report and graphical forms. The source of the data is a file created from the STORET data base by a standard retrieval. The graphical output is generated by the Integrated Plotting Package (2,3).

This report documents the logic and operation of the programs and presents the data from the Raritan River Basin as a test application.

INTRODUCTION

One of the most effective and meaningful ways in communicating information on water quality to top management and the general public is with a water quality index.

The "PDI" index which was developed by the MITRE Corporation(4) (Prevalence - Duration - Intensity Index), allows for a water body to be described in terms of the prevalence, duration and intensity of its water pollution. This index was based on how much water quality deviates from water quality standards, which vary on location depending on its intended use.

Other proposed indices are oriented towards a particular water use or are constructed for specific areas. Only the National Sanitation Foundation Water Quality Index can be consistently applied to any area and can be quantitatively compared in reporting overall quality trends.

The cummulative form of the NSF - WQI may be written as:

$$WQI(c) = \sum_{i=1}^{n} w_i q_i \tag{1}$$

where

$WQI(c)$ = the cummulative Water Quality Index, a number between 0 and 100

q_i = the quality of the ith parameter, a number between 0 and 100, (read from unit qualigram curves - see appendix A)

w_i = the unit weight of the ith parameter, a number between 0 and 0.17

n = 9, the number of parameters

In the WQI(c) expression above the nine parameters are:

- dissolved oxygen (DO), as percent saturation
- fecal coliform density (FC), no./100 ml
- pH
- nitrates (NO_3), mg/l NO_3-N
- phosphates (PO_4), mg/l PO_4-P
- 5 day biochemical oxygen demand (BOD_5), mg/l

- temperature, °C departure from equilibrium
- total solids, mg/l
- turbidity, JTU (Jackson turbidity units)

This additive model was adequate when all parameters are within a reasonable range, but it lacked sensitivity in forcing the effect of a single low value or poor quality on the overall water quality. As a result, a multiplicative form of the NSF - WQI was developed as:

$$WQI(M) = \prod_{i=1}^{n} q_i^{w_i} \qquad (2)$$

where

$WQI(M)$ = the multiplicative water quality index, a number between 0 and 100 (theoretical),

q_i = the quality of the ith parameter, a number between 0 and~100,

w_i = the unit weight of the ith parameter, a number between 0 and 0.17

n = the number of parameters.

The computer programs:

Four distinct programs will be described:

a) The reporting and graphical display of the cummulative or multiplicative NSF - WQI for the retrieved STORET stations, as a function of time.

b) The reporting and graphical display of the parameters used to compute the NSF - WQI, by plotting five parameters to a frame as a function of time.

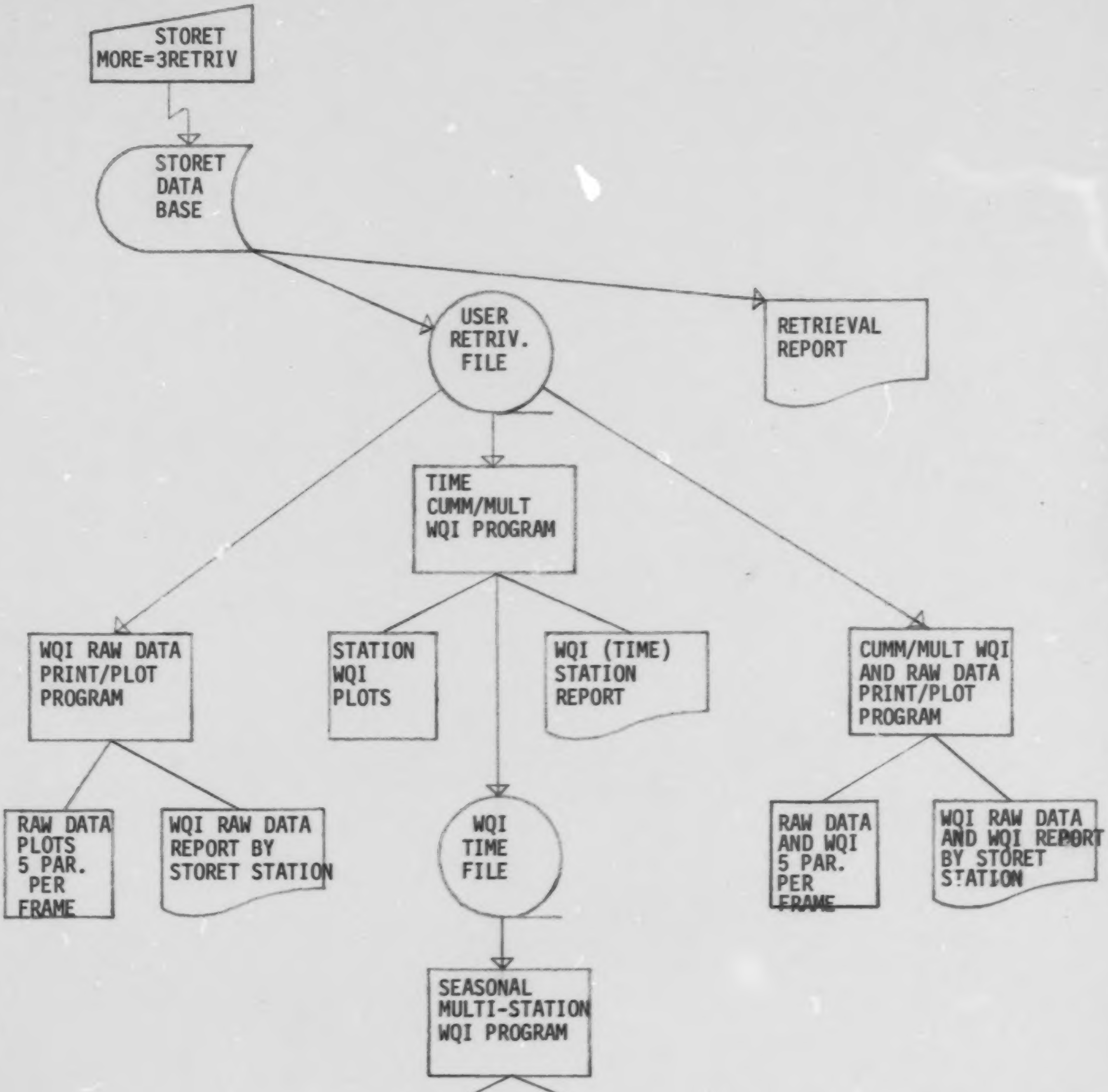
c) The graphical display of the NSF - WQI for the specified time intervals versus STORET station numbers or station mile points.

d) The reporting and graphical display of the parameters used to compute the NSF - WQI, and the cummulative or multiplicative NSF - WQI by plotting five parameters to a frame as a function of time.

The graphical output is generated by calling subroutines of the Integrated Plotting Package. This procedure creates a neutral text of instructions, which are subsequently processed as line printer plots, or as calcomp plots or by using the Time Sharing Option at WCC, the plot can be created interactively on the 4014 Tektronics terminal.

FIGURE 1

SYSTEM FLOWCHART OF NSF-WQI GRAPHICS FROM STORET DATA BASE


STORET MORE=3RETRIV
STORET DATA BASE
USER RETRIV. FILE
RETRIEVAL REPORT
TIME CUMM/MULT WQI PROGRAM
WQI RAW DATA PRINT/PLOT PROGRAM
STATION WQI PLOTS
WQI (TIME) STATION REPORT
CUMM/MULT WQI AND RAW DATA PRINT/PLOT PROGRAM
RAW DATA PLOTS 5 PAR. PER FRAME
WQI RAW DATA REPORT BY STORET STATION
WQI TIME FILE
RAW DATA AND WQI 5 PAR. PER FRAME
WQI RAW DATA AND WQI REPORT BY STORET STATION
SEASONAL MULTI-STATION WQI PROGRAM
SEASONAL PLOT(S) BY/STAT/ MILE PT.
PLOT ANALYSIS REPORT

PROGRAM A: PLOT/PRINT NSF - WQI TIME PROFILE FOR STORET STATIONS

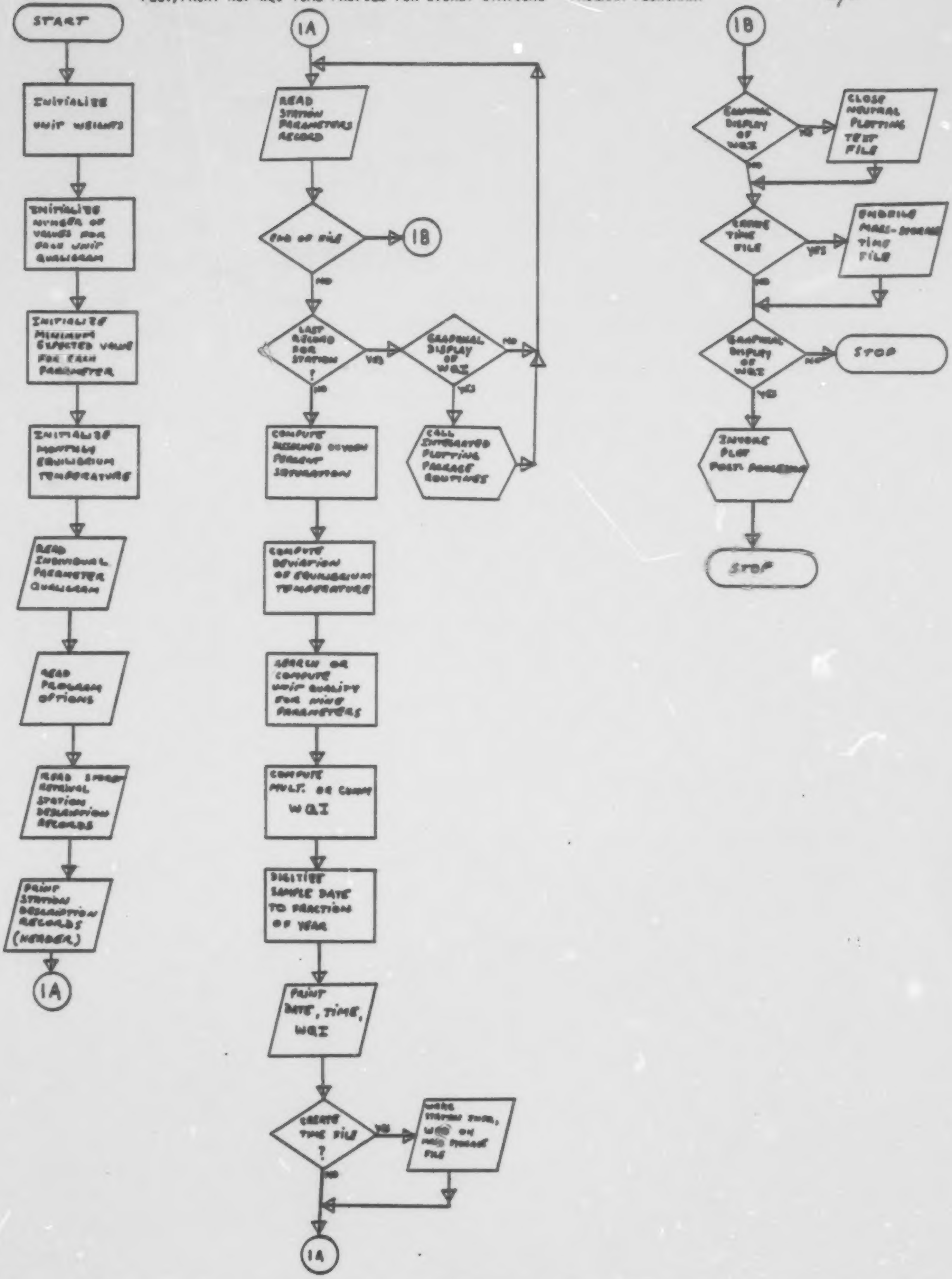
This program reads input from a STORET "More = 3" retrieval and computes multiplicative or cummulative water quality indices and outputs these on a report format. The user can also direct the program to produce printer or calcomp plots, by modifying Job Control statements. The program has been written in a general form so that it may be applied with very minor modifications anywhere in the United States.

The program begins by setting monthly equilibrium temperatures for the given area(5), then reads control options specified by the user and the digitized unit qualigrams. Then the first station in the storet retrieval is processed. If all the nine parameters used in the index are not present, the data for this date/time record is bypassed. Observations with all parameters present are first edited so that extraneous values (if present) are eliminated. The the saturation level of oxygen is computed using temperature and chloride concentration, from this value the dissolved oxygen concentration as % saturation is arrived. Next, the deviation from equilibrium temperature is computed.

If the unit quality of a parameter falls in between two defined values, a linear interpolation is performed to compute the unit quality for the parameter. Once all nine unit qualities are known a cummulative or multiplicative index is computed. Then the sample date is digitized to a fraction of the year. These two values; the index and the digitized date are then saved in a vector for plotting. The program then goes to the next date/time observation and performs these same operations. Once the last record for this station is processed, the program breaks control and calls Integrated Plotting routines. These routines create a so-called "neutral-text" on a mass storage file and returns to process the next station as outlined above.

Once all the stations have been processed, a plot post-processor is invoked which will produce a printer-plot, a calcomp plot or if interactively, a Tektronics CRT display.

PLOT/PRINT NSF-WQI TIME PROFILE FOR STORET STATIONS - PROGRAM FLOWCHART


START
INITIALIZE UNIT WEIGHTS
INITIALIZE NUMBER OF VALUES FOR EACH UNIT QUALIGRAM
INITIALIZE MINIMUM EXPECTED VALUE FOR EACH PARAMETER
INITIALIZE MONTHLY EQUILIBRIUM TEMPERATURE
READ INDIVIDUAL PARAMETER QUALIGRAM
READ PROGRAM OPTIONS
READ STORET RETRIEVAL STATION DESCRIPTION RECORDS
PRINT STATION DESCRIPTION RECORDS (HEADER)
1A
1A
READ STATION PARAMETERS RECORD
END OF FILE
1B
NO
LAST RECORD FOR STATION ?
YES
NO
GRAPHICAL DISPLAY OF WQI
NO
YES
CALL INTEGRATED PLOTTING PACKAGE ROUTINES
COMPUTE DISSOLVED OXYGEN PERCENT SATURATION
COMPUTE DEVIATION OF EQUILIBRIUM TEMPERATURE
SEARCH OR COMPUTE UNIT QUALITY FOR NINE PARAMETERS
COMPUTE MULT. OR COMP WQI
DIGITIZE SAMPLE DATE TO FRACTION OF YEAR
PRINT DATE, TIME, WQI
CREATE TIME FILE ?
YES
NO
WRITE STATION INFO, WQI ON MASS STORAGE FILE
1A
1B
GRAPHICAL DISPLAY OF WQI
YES
NO
CLOSE NEUTRAL PLOTTING TEXT FILE
CREATE TIME FILE
YES
NO
ENDFILE MASS-STORAGE TIME FILE
GRAPHICAL DISPLAY OF WQI
NO
STOP
YES
INVOKE PLOT POST-PROCESSOR
STOP

PROGRAM A: PLOT/PRINT NSF-WQI TIME PROFILE FOR STORET STATIONS

PROGRAM INPUT

(1) TO UPDATE PROGRAM WITH EQUILIBRIUM TEMPERATURES:
If necessary, change source statement number 53 to the applicable equilibrium temperatures. Reference no. 5 has tables listing these values applicable to most locations in the United States.

(2) TO MODIFY DIGITIZED UNIT QUALIGRAMS FOR PARAMETERS:
The data shown on page 10 is for linear approximations to the mean curve of the unit qualigrams for each of the nine parameters as shown on Appendix A. This data is provided with the program. If the user desires to improve these values, first modify source statement number 32 to the new number values to be read for each parameter, then read these values as follows:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 10	TABLE (1,1,1)	F10.0	1st value of x-scale for 1st parameter
11 - 20	TABLE (2,1,1)	F10.0	2nd value of x-scale for 1st parameter
.	.	.	.
.	.	.	.
.	.	.	.
71 - 80	TABLE (8,1,1)	F10.0	8th value of x-scale for 1st parameter

The card above is repeated until all x-scale values for the 1st parameter unit qualigrams have been read.

The y-values (unit qualities) for the corresponding x-values read above are now entered:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 10	TABLE (1,2,1)	F10.0	corresponding 1st value of y-scale for 1st parameter
11 - 20	TABLE (2,2,1)	F10.0	corresponding 2nd value of y-scale for 1st parameter
.	.	.	.
.	.	.	.
.	.	.	.
71 - 80	TABLE (8,2,1)	F10.0	8th value of y-scale for 1st parameter

This card above is repeated (if necessary) until all corresponding y values for the x-values read in previously have been entered.

Next the x-values and the associated unit quality for the 2,3...9 parameters are entered in an identical manner. For the last parameter this input would be:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 10	TABLE (1,1,9)	F10.0	1st value of x-scale for 9th parameter
11 - 20	TABLE (2,1,9)	F10.0	2nd value of x-scale for 9th parameter
.	.	.	.
.	.	.	.
.	.	.	.
71 - 80	TABLE (8,1,9)	F10.0	8th value of x-scale for 9th parameter

As previously, the above card is repeated if necessary.

Next the y-values for the corresponding x-values are entered:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 10	TABLE (1,2,9)	F10.0	corresponding 1st value of y-scale for 9th parameter
11 - 20	TABLE (2,2,9)	F10.0	corresponding 2nd value of y-scale for 9th parameter
.	.	.	.
.	.	.	.
.	.	.	.
71 - 80	TABLE (8,2,9)	F10.0	corresponding 8th value of y-scale of 9th parameter

Again, as in the first parameter, the above card is repeated if it was necessary in inputting the x-scale for this parameter.

3) PROGRAM OPTIONS CARD

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 2	OPTION (1)	I2	OPTION (1) = 0 for CUMM WQI OPTION (1) > 0 for MULT WQI
3 - 4	OPTION (2)	I2	OPTION (2) = 0, REPORT ONLY OPTION (2) > 0, PRINT REPORT AND ALSO PLOT
5 - 6	OPTION (3)	I2	OPTION (3) > 0 TO CREATE TIME FILE USED IN MULTI-STATION WQI PROGRAM (SEE FORTRAN FILE 25) IN JCL STATEMENTS

4) STORET "MORE = 3" RETRIEVAL

This retrieval must precede this program, and is referenced in the JCL statements as "fortran file (20)", see sample deck setup in the following section.

SAMPLE INPUT

1) Deck setup for execution from source statements:

```
//EPAIII   JOB ('AAAA')
//STEP1 EXEC IPP906G
//FORT.SYSIN DD *
                          .                                  .
                          .                                  .
                          .                                  .
                             SOURCE DECK GOES HERE
                          .                                  .
                          .                                  .
                          .                                  .
//GO.FT20F001 DD DSN=(FILE NAME FROM STORET RETRIEVAL GOES HERE),
// UNIT=3330-1,DISP=OLD,LABEL=(,,,IN)
//GO.FT25F001 DD DSN=(TIMEFILE NAME GOES HERE),VOL=SER=DDDDDD
// UNIT=3330-1,DISP=(NEW,CATLG),SPACE=(TRK,(5,1),RLSE),
// DCB=(RECFM=FB,LRECL=99,BLKSIZE=12969)
//GO.FT08F001 DD *
26.  29.  39.  54.  66.  77.  82.  79.  69.  57.  39.  29.
0.0       20.0      30.0      40.0      50.0      60.0      78.0      80.0
100.0     120.0     140.0
3.0       12.0      20.0      30.0      44.0      60.0      75.0      86.0
100.0     89.0      73.0
1.0       2.0       5.0       10.0      20.0      50.0      100.0     300.0
500.0     1000.0    2000.0    5000.0    10000.0   20000.0   100000.0
100.0     88.0      77.0      68.0      58.0      47.0      40.0      30.0
26.0      21.0      18.0      12.0      9.0       7.0       5.0
2.0       3.0       3.3       4.0       4.5       5.0       5.5       6.0
6.4       7.0       7.2       7.4       7.8       8.0       8.5       9.0
10.0      10.5      11.0      12.0
2.0       4.0       7.0       10.0      16.0      27.0      42.0      62.0
80.0      91.0      93.0      94.0      90.0      87.0      80.0      45.0
18.0      10.0      6.0       3.0
0.0       5.        10.       15.       20.       25.       30.
100.      53.       31.       18.       11.       7.        5.
0.0       5.0       10.       20.       30.       40.       50.       60.
70.       80.       90.       100.
100.      66.       49.       32.       23.       17.       12.       7.
4.        2.0       1.2       1.1
0.0       .5        1.        2.        3.        4.        5.        6.
7.        8.        9.        10.
100.      60.       41.       25.       18.       12.       10.       8.
7.        6.        5.        4.
0.0       1.25      2.5       5.0       6.25      7.5       8.9       10.0
12.5      15.0      17.5      20.0
52.0      71.0      81.0      93.0      86.0      76.0      50.0      40.0
26.0      18.0      12.0      9.0
0.0       10.       20.       30.       40.       50.       60.       70.
80.       90.       100.
100.      77.       62.       52.       44.       38.       32.       28.
24.       20.       17.
0.0       50.       100.      150.      200.      250.      300.      350.
400.      450.      500.
80.       86.       84.       81.       74.       68.       61.       54.
47.       39.       33.
010101
//PLOT.FT07F001 DD SYSOUT=(K,,6129)
```

2) EXECUTION OF PROGRAM FROM LOAD MODULE:

```
//EPAIII   JOB ('AAAA')
//STEP1 EXEC PGM=WQITIME,REGION=150K
//STEPLIB DD DSN=CN.EPAGAN.R2TW.WQMODL,DISP=SHR
//FT01F001 DD DDNAME=SYSIN,DCB=BLKSIZE=80
//FT06F001 DD SYSOUT=A
//FT07F001 DD SYSOUT=B
//FT16F001 DD SYSOUT=B
//FT15F001 DD SYSOUT=A
//FT02F001 DD DSN=&IPPTAPE,UNIT=SYSDA,SPACE=(CYL,(1,1),RLSE),
// DCB=(RECFM=VSB,LRECL=516,BLKSIZE=3156,DSORG=PS),
// DISP=(NEW,PASS,DELETE)
//FT20F001 DD DSN=(FILE NAME FROM STORET RETRIEVAL GOES HERE),
// UNIT=3330-1,DISP=OLD,LABEL=(,,,IN)
//FT25F001 DD DSN=(TIMEFILE NAME GOES HERE),VOL=SER=DDDDDD,
// UNIT=3330-1,DISP=(NEW,CATLG),SPACE=(TRK,(5,1),RLSE),
// DCB=(RECFM=FB,LRECL=99,BLKSIZE=12969)
//FT08F001 DD *
26.  29.  39.  54.  66.  77.  82.  79.  69.  57.  39.  29.
0.0       20.0      30.0      40.0      50.0      60.0      78.0      80.0
100.0     120.0     140.0
3.0       12.0      20.0      30.0      44.0      60.0      75.0      86.0
100.0     89.0      73.0
1.0       2.0       5.0       10.0      20.0      50.0      100.0     300.0
500.0     1000.0    2000.0    5000.0    10000.0   20000.0   100000.0
100.0     88.0      77.0      68.0      58.0      47.0      40.0      30.0
26.0      21.0      18.0      12.0      9.0       7.0       5.0
2.0       3.0       3.3       4.0       4.5       5.0       5.5       6.0
6.4       7.0       7.2       7.4       7.8       8.0       8.5       9.0
10.0      10.5      11.0      12.0
2.0       4.0       7.0       10.0      16.0      27.0      42.0      62.0
80.0      91.0      93.0      94.0      90.0      87.0      80.0      45.0
18.0      10.0      6.0       3.0
0.0       5.        10.       15.       20.       25.       30.
100.      53.       31.       18.       11.       7.        5.
0.0       5.0       10.       20.       30.       40.       50.       60.
70.       80.       90.       100.
100.      66.       49.       32.       23.       17.       12.       7.
4.        2.0       1.2       1.1
0.0       .5        1.        2.        3.        4.        5.        6.
7.        8.        9.        10.
100.      60.       41.       25.       18.       12.       10.       8.
7.        6.        5.        4.
0.0       1.25      2.5       5.0       6.25      7.5       8.9       10.0
12.5      15.0      17.5      20.0
52.0      71.0      81.0      93.0      86.0      76.0      50.0      40.0
26.0      18.0      12.0      9.0
0.0       10.       20.       30.       40.       50.       60.       70.
80.       90.       100.
100.      77.       62.       52.       44.       38.       32.       28.
24.       20.       17.
0.0       50.       100.      150.      200.      250.      300.      350.
400.      450.      500.
80.       86.       84.       81.       74.       68.       61.       54.
47.       39.       33.
010101
//STEP2 EXEC PGM=CMP906A,REGION=100K,COND=(8,LE)
//STEPLIB DD DSN=CN.EPACAW.SASS.IPP.LODMOD,DISP=SHR
//FT01F001 DD DDNAME=SYSIN,DCB=BLKSIZE=80
//FT02F001 DD DSN=&IPPTAPE,DISP=(OLD,DELETE,DELETE)
//FT06F001 DD SYSOUT=A
//FT07F001 DD SYSOUT=(K,,6129)
//FT10F001 DD DUMMY
//FT15F001 DD SYSOUT=A
//FT03F001 DD DDNAME=PLOTTAPE
//PLOTTAPE DD SYSOUT=B
```

PROGRAM A: PLOT/PRINT NSF - WQI TIME PROFILE FOR STORET STATIONS

SAMPLE OUTPUT

STATION 340028

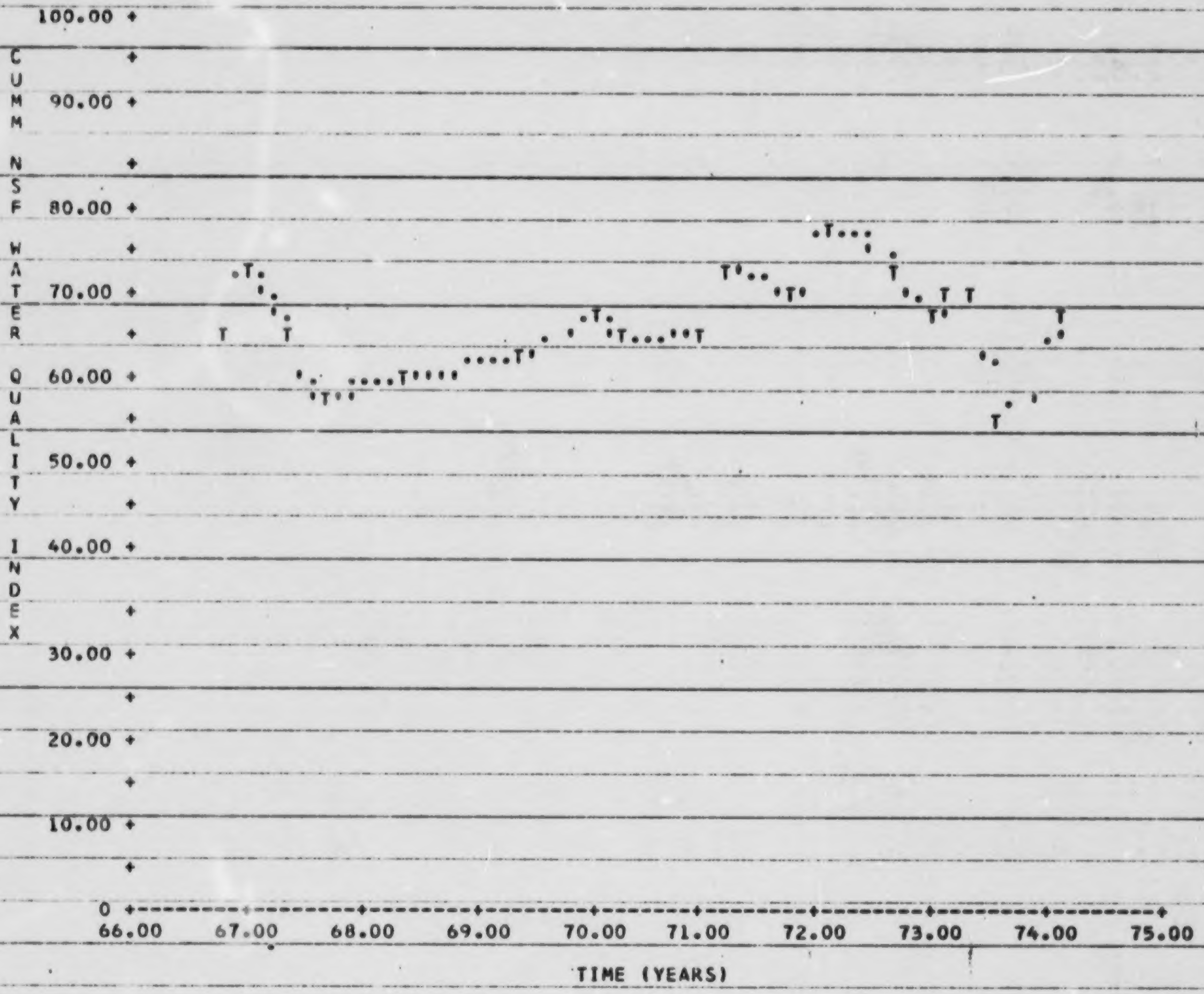
```
 340028          170
40 55 16.0 074 50 27.0 2
PEQUEST RIVER
34       NEW JERSEY
NORTH ATLANTIC            020392
DELAWARE RIVER
21NJDEP1                 2111204
 0000 FEET  DEPTH  CLASS 00
```

DATE	DIG. YR.	TIME	CUMM WQI
8/22/66	0.641		64.
10/31/66	0.833		73.
6/21/67	0.471		73.
9/26/67	0.737		71.
11/20/67	0.888		71.
1/23/68	0.063		74.
4/16/68	0.292		72.
8/20/68	0.637		73.
12/ 2/68	0.921		73.
3/11/69	0.192		76.
5/27/69	0.403	1100	75.
12/17/69	0.962	1038	75.
3/ 5/70	0.175	1045	76.
5/ 4/70	0.340		69.
11/16/70	0.877	1015	66.
2/ 9/71	0.110	1045	69.
5/11/71	0.359	1030	70.
9/ 8/71	0.688	1100	75.
12/ 7/71	0.934	1040	72.
3/ 9/72	0.189	1045	77.
6/14/72	0.454	1230	74.
10/18/72	0.798		74.
3/ 6/73	0.178		74.
5/16/73	0.373		72.
10/ 1/73	0.751		77.
12/11/73	0.945		70.

```
STATION 341004
                                                                 341004        4
                                                                40 04 52.0 074 09 07.0 2
                                                                METEDECONK RIVER  N. BRANCH
                                                                34      NEW JERSEY
                                                                NORTHEAST
                                                                NEW JERSEY COASTAL
                                                                21NJDEP1                2111204
                                                                 0000 FEET  DEPTH  CLASS 00

                                  MULT
   DATE      DIG. YR.    TIME     WQI
 11/22/66     0.893               77.
  2/28/67     0.162               83.
  9/13/67     0.701               62.
 11/ 1/67     0.836               66.
  6/ 4/68     0.426               59.
  8/ 1/68     0.585      1310     49.
 10/22/68     0.809               59.
  1/22/70     0.060               77.
  3/16/70     0.205      1300     67.
  3/29/71     0.241      1245     77.
  1/19/72     0.052      1310     78.
  1/19/72     0.052               78.
  4/10/72     0.276      1245     72.
  4/10/72     0.276               72.
 12/12/72     0.948               79.
  2/20/73     0.140               83.
  5/ 7/73     0.348               71.
  9/24/73     0.732               60.
 12/ 5/73     0.929               64.
  1/14/74     0.038               74.
```

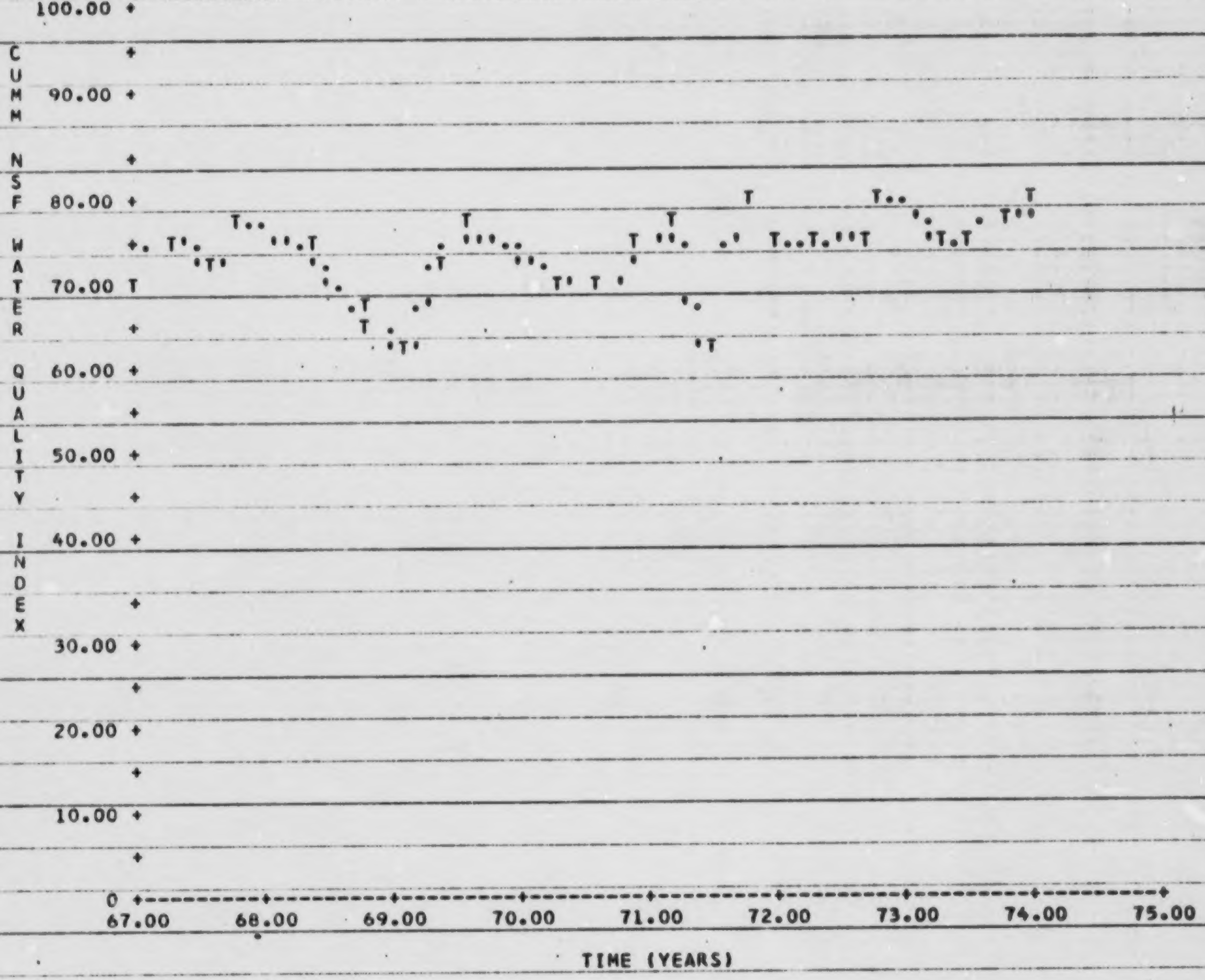
```
P R I N T E R   P O S T P R O C E S S O R   OF IPP    - COMMENTS AND ERROR MESSAGES -     VERSION 01 MAY 74

FRAME NUMBER     1 STARTING WITH RECORD NUMBER       1
FRAME NUMBER     1 PROCESSED WITH     0 ERRORS DETECTED

SUMMARY
          RECORDS     67
          FRAMES       1
          ERRORS       0

END OF POSTPROCESSOR RUN FOR IPP
```

PANEL 1 FRAME 6



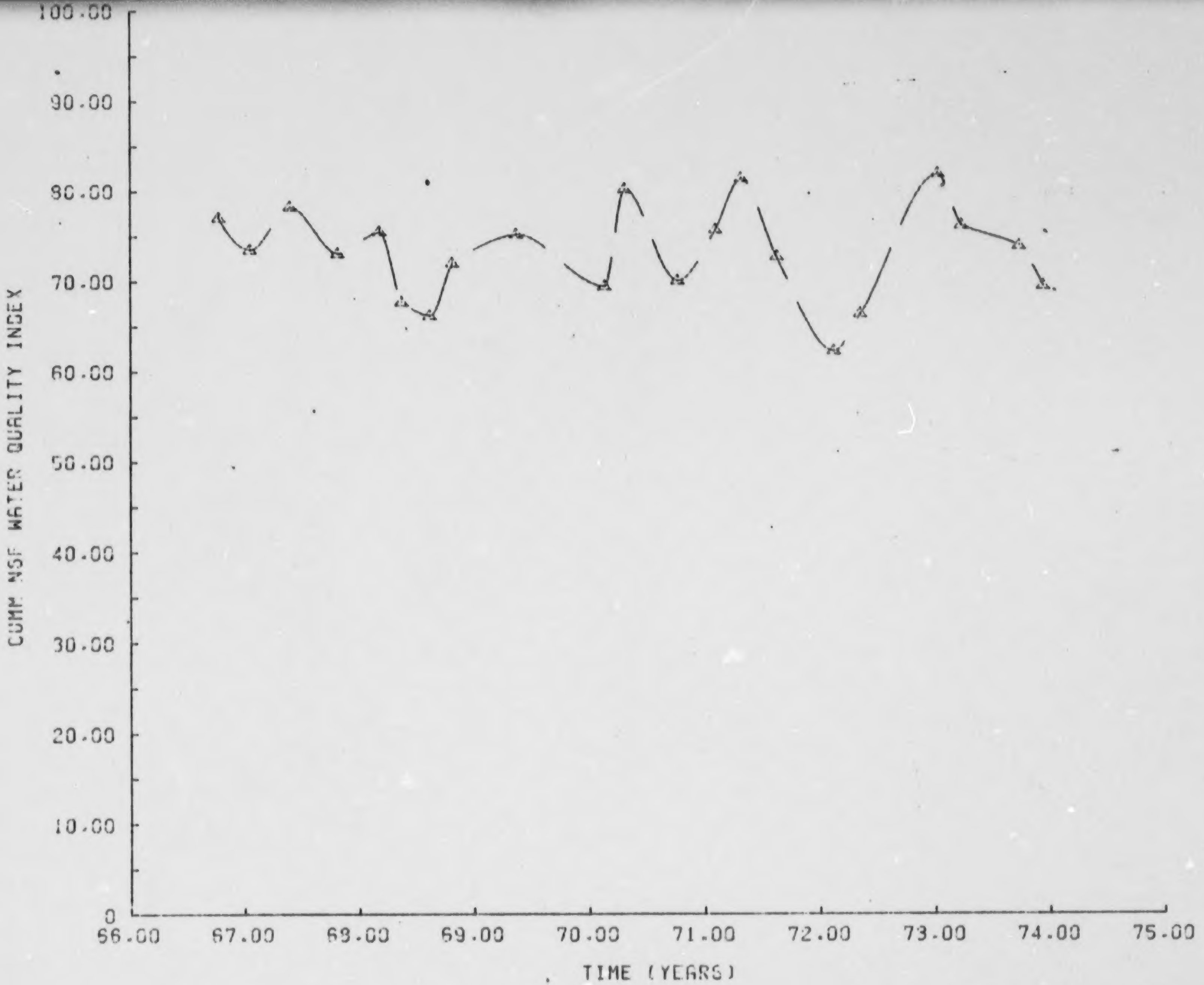
STORET STATION NO. 343045 MILLSTONE RIVER

PANEL 1 FRAME 8

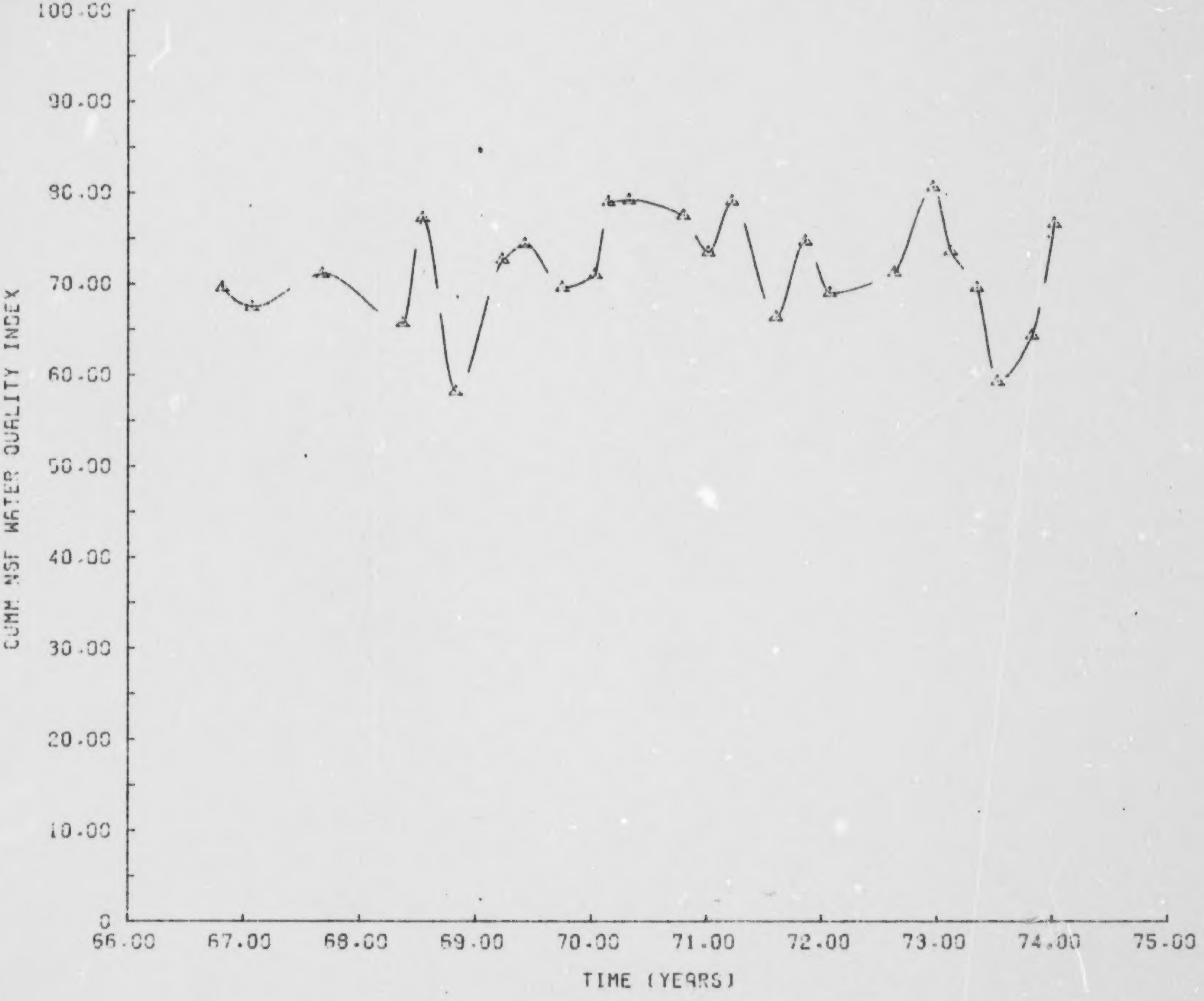


STORET STATION NO. 343051 STONY BROOK

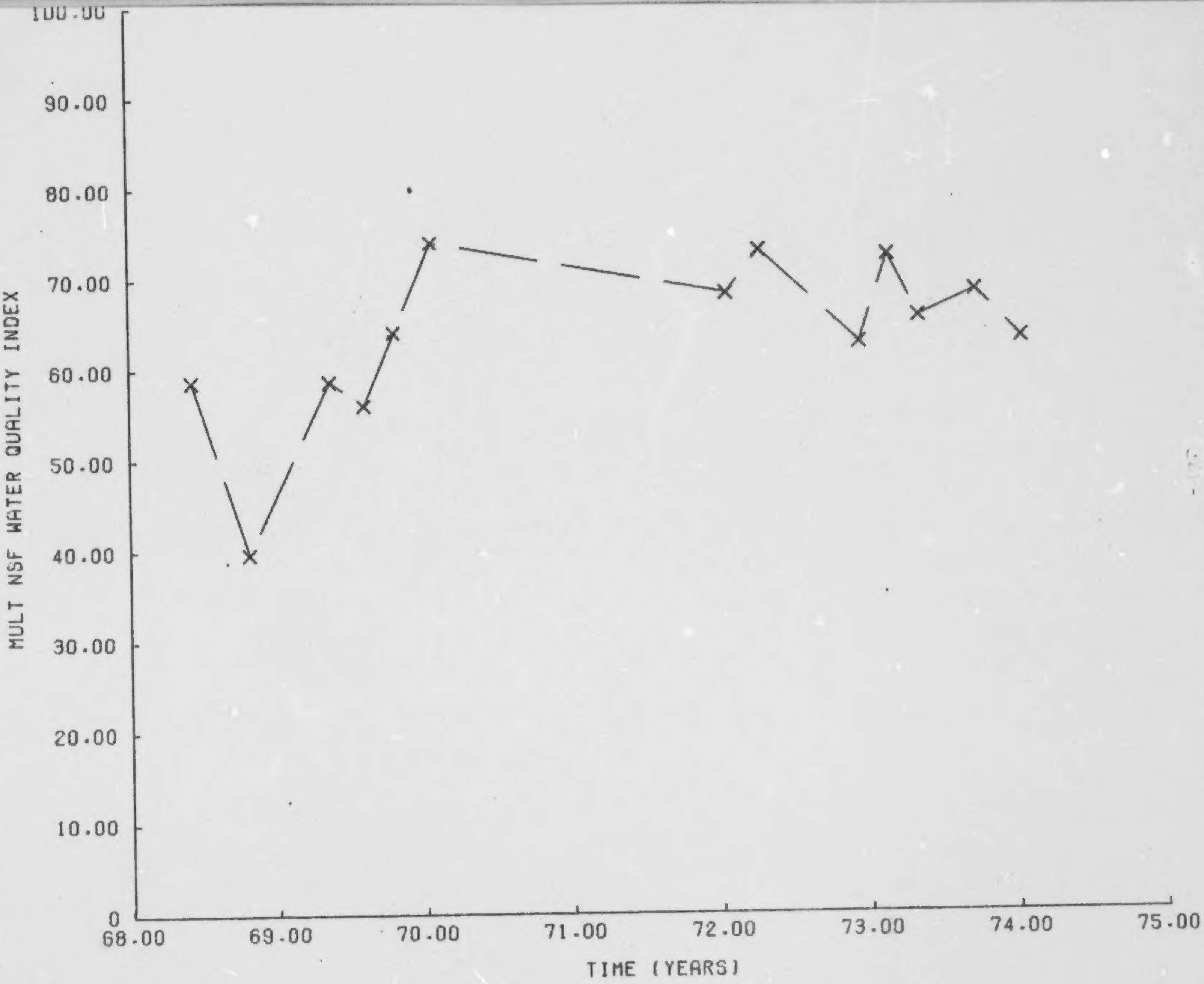
```
C A L C O M P   P O S T P R O C E S S O R  OF IPP    - COMMENTS AND ERROR MESSAGES -     VERSION 01 MAY 74

FRAME NUMBER     1 STARTING WITH RECORD NUMBER       1
FRAME NUMBER     1 PROCESSED WITH     0 ERRORS DETECTED

SUMMARY
           RECORDS     77
           FRAMES       1
           ERRORS       0

END OF POSTPROCESSOR RUN FOR IPP
```



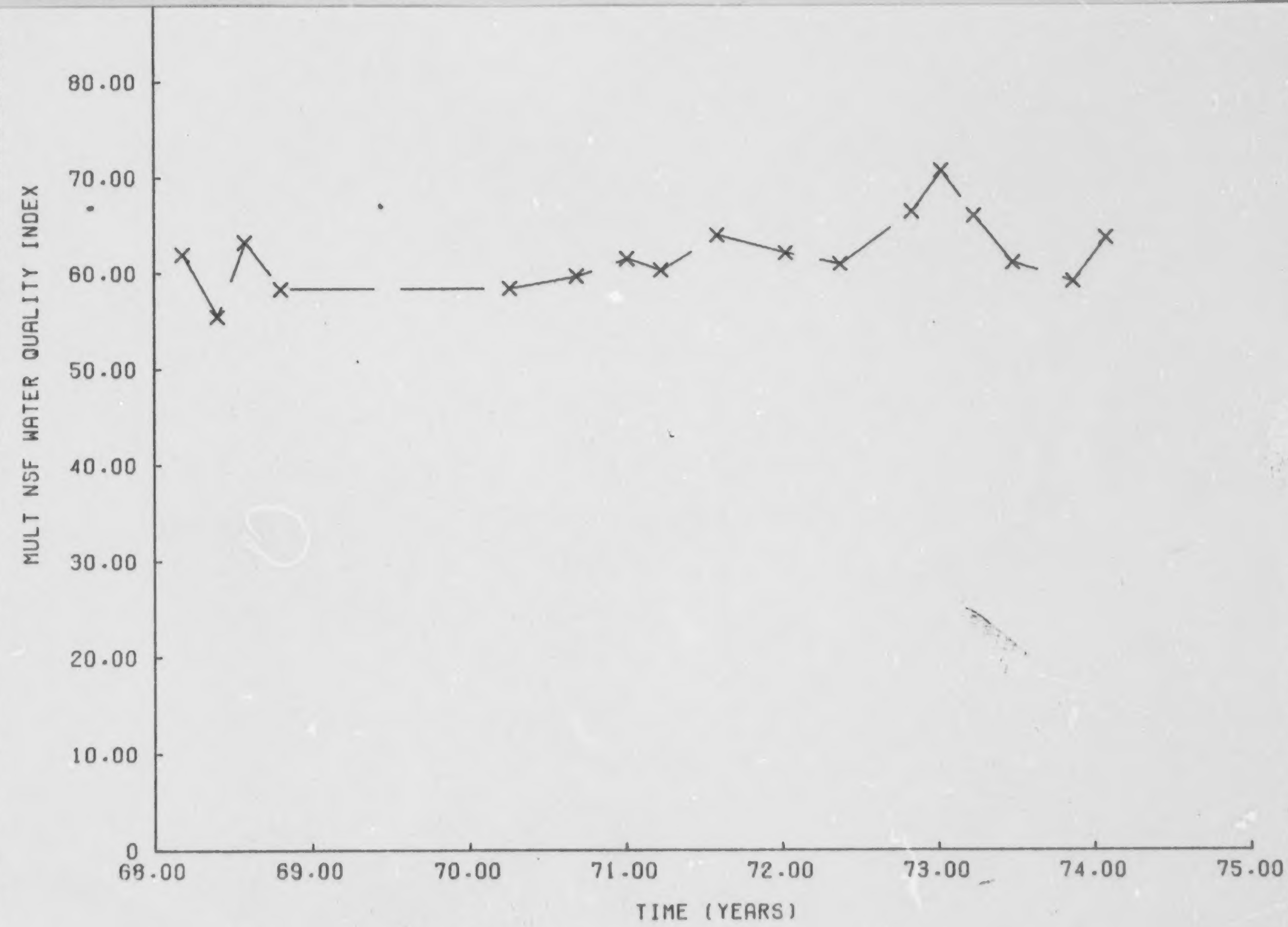
STORET STATION NO. 343014 RARITAN RIVER (R14)



STORET STATION NO. 343062 RARITAN RIVER S. BRANCH



STORET STATION NO. 341007 TOMS RIVER RIDGEWAY BRANCH



STORET STATION NO. 341008 WADING RIVER W. BRANCH

PROGRAM A - SOURCE LISTING

```
C     ******************************************************************
C     ******************************************************************
C
C     GENERALIZED NSF WATER QUALITY INDEX PROGRAM
C
C     *** USER SPECIFIES CUMMULATIVE OR MULTIPLICATIVE INDEX ***
C
C     *** OPTIONNAL GRAPHS ON PRINTER OR DIGITAL PLOTTER ***
C
C     ******************************************************************
C     ******************************************************************
C
      INTEGER OPTION(3)
      DIMENSION PLDATA(30),SYMBOL(14),XXVAL(100),YYVAL(100),SCL(5)
      DIMENSION TOP(12),TABLE(20,2,9),MAXX(9),WEIGHT(9),QMAX(9)
      DIMENSION AGENCY(2),DESCRP(30),EQTEMP(12),PARAM(10),SMALL(9),
     1QUAL(9),STAT(4),DAYS(12),HSTAT(4)
      DIMENSION BUFX(500),BUFY(500)
C     ******************************************************************
C
C     THE NEXT STATEMENT HAS THE UNIT WEIGHT FACTORS FOR EACH PARAMETER
C
C     ******************************************************************
      DATA WEIGHT/.17,.15,.12,.10,.10,.10,.10,.08,.08/
C     ******************************************************************
C
C     THIS NEXT DATA STATEMENT HAS THE MAXIMUM NO. OF POINTS IN EACH
C     UNIT QUALIGRAM  --  FOR PROGRAM CONTROL
C
C     ******************************************************************
      DATA MAXX/11,15,20,7,12,12,12,11,11/
      DATA DAYS/31.,28.,31.,30.,31.,30.,31.,31.,30.,31.,30.,31./
      DATA SKPTIM/'2500'/,SPACE/'    '/
      DATA SMALL/0.,1.,2.,0.,0.,0.,-10.,0.0,0.0/
      DATA SYMBOL/'Q','O','T','+','X','D','A','M','Z','Y','B','*','H','I
     1'/
C     ******************************************************************
C
C     THE NEXT DATA STATEMENT IS THE UNIT QUALITY, ASSIGNED TO A
C     PARAMETER EXCEEDING THE RANGES IN THE QUALIGRAMS
C
C     ******************************************************************
      DATA QMAX/50.,2.,0.0,2.,1.,2.,5.,5.,20./
      M=8
      READ(M,9876)EQTEMP
 9876 FORMAT(12(F3.0,2X)
C     ******************************************************************
C
C     READ INDIVIDUAL PARAMETER QUALIGRAMS
C
C     ******************************************************************
      DO 150  I=1,9
      MAX=MAXX(I)
```

PROGRAM A - SOURCE LISTING

```
C
C     FIRST -- THE X-SCALE IS READ INTO TABLE(J,1,I)
C
      READ(M,151)(TABLE(J,1,I),J=1,MAX)
  151 FORMAT(8F10.0)
C
C     NOW READ IN THE ASSOCIATED Y VALUE FOR THE X'S ABOVE
C
      READ(M,151)(TABLE(J,2,I),J=1,MAX)
  150 CONTINUE
      ISEQ=0
C
C     'ISEQ' IS USED TO IDENTIFY STORET STATIONS BY A UNIQUE SEQUENTIAL
C     NUMBER ... USED IF PLOTTING SEASONAL WQI BY MILE PTS. OR STAT. NO.
C
      KK=0
      XXMAX=0.0
      YYMAX=0.0
C
C     ******************************************************************
C
C     READ PROGRAM OPTIONS  ...
C
C     OPTION(1)=0, FOR CUMM. INDEX   =1,FOR MULTIPLICATIVE INDEX
C     OPTION(2)=0, FOR NO PLOT,  ... =1,FOR WQI PLOT
C     OPTION(3)=1, TO CREATE FILE USED IN PLOTTING WQI BY STATIONS
C     IF STATION  PLOTTING WILL NOT FOLLOW  --  LEAVE OPTION(3) BLANK
C
C     ******************************************************************
      READ(M,101)OPTION
101   FORMAT(3I2)
C     ******************************************************************
C
C     CONVERT MONTHLY EQUILIBRIUM TEMPERATURES TO DEGREES CENTIGRADE
C
C     ******************************************************************
      DO 1  I=1,12
      EQTEMP(I)=(EQTEMP(I)-32.)*.55556
    1 CONTINUE
C     ******************************************************************
C
C **READ DELIMITER RECORD - VERIFY BEGINNING OF DATA RECORDS**
C
C     ******************************************************************
 12   READ(20,111,END=400) IDUMMY
  111 FORMAT(25X,I2)
      IF (IDUMMY.EQ.99) GOTO 22
      GOTO 12
  232 IF(OPTION(2).LE.0)GO TO 432
C
C     GRAPH OF WATER QUALITY INDEX FOR STATION WILL BE DONE IF DESIRED
C
C     ******************************************************************
```

```
C                                                                       TWQI107
C     *** COMMANDS BELOW USE THE INTEGRATED PLOTTING PACKAGE ***        TWQI108
C                                                                       TWQI109
C     ***************************************************************** TWQI110
C                                                                       TWQI111
C     SET INITIAL VALUES ON SPECIFICATIONS ARRAY                        TWQI112
      CALL SSPECS(PLDATA)                                               TWQI113
C                                                                       TWQI114
C     SET PLOTTING SYMBOL DESIRED                                       TWQI115
C                                                                       TWQI116
      PLDATA(16)=SYMBOL(3)                                              TWQI117
C                                                                       TWQI118
C     RESET SIZE OF AXES (INCHES)  Y ONLY                               TWQI119
C                                                                       TWQI120
      PLDATA(8)=7.0                                                     TWQI121
C                                                                       TWQI122
C     MOVE X-AXIS 2 INCHES AWAY FROM ORIGIN                             TWQI123
C                                                                       TWQI124
      PLDATA(2)=2.0                                                     TWQI125
C                                                                       TWQI126
C     ENTER NUMBER OF DATA POINTS TO PLOT                               TWQI127
C                                                                       TWQI128
      PLDATA(13)=MM-1                                                   TWQI129
C                                                                       TWQI130
C     CLEAR WORK AREA                                                   TWQI131
C                                                                       TWQI132
      DO 15  K=1,5                                                      TWQI133
   15 SCL(K)=0.0                                                        TWQI134
C                                                                       TWQI135
C     SET RANGE OF VALUES ON X-AXIS,  NO. DIVISIONS=NO. YEARS ANALYZED  TWQI136
C                                                                       TWQI137
      KK=XXMAX+1                                                        TWQI138
      PLDATA(3)=KK                                                      TWQI139
      KK2=XXVAL(1)                                                      TWQI140
      PLDATA(4)=KK2                                                     TWQI141
      PLDATA(9)=KK-KK2                                                  TWQI142
C                                                                       TWQI143
C     SET RANGE OF VALUES ON Y-AXIS                                     TWQI144
C                                                                       TWQI145
      PLDATA(5)=100.                                                    TWQI146
      PLDATA(6)=0.0                                                     TWQI147
C                                                                       TWQI148
C     CHANGE DEFAULT VALUE OF DIVISIONS FOR Y-AXIS                      TWQI149
C                                                                       TWQI150
      PLDATA(10) = 10.                                                  TWQI151
C                                                                       TWQI152
C     DRAW ANNOTATION NUMBERS AT THE BOTTOM SCALE MARKS                 TWQI153
C                                                                       TWQI154
      CALL NODLIB(PLDATA)                                               TWQI155
C                                                                       TWQI156
C     DRAW ANNOTATION NUMBER AT THE LEFT SCALE MARKS                    TWQI157
C                                                                       TWQI158
      CALL NODLIL(PLDATA)                                               TWQI159
```

```
C                                                                       TWQI160
C     DRAW  X-Y  AXES ... DOUBLE NO. OF TICK MARKS IN Y-AXIS            TWQI161
C                                                                       TWQI162
      PLDATA(10)=20.0                                                   TWQI163
      CALL AXLILI(PLDATA)                                               TWQI164
C                                                                       TWQI165
CC    CLEAR ZONES VARIABLES --  SINCE UPDATED BY ABOVE SUBROUTINE       TWQI166
C                                                                       TWQI167
      CALL ZZONES(PLDATA)                                               TWQI168
C                                                                       TWQI169
C     PLOT SYMBOL AT DATA POINT LOCATIONS                               TWQI170
C                                                                       TWQI171
      CALL PSLILI(XXVAL,YYVAL,PLDATA)                                   TWQI172
C                                                                       TWQI173
C     NOW CONNECT DATA POINTS WITH PARABOLAS TO FIT THE DATA ...        TWQI174
C                                                                       TWQI175
C                                                                       TWQI176
      CALL PFLILI(XXVAL,YYVAL,BUFX,BUFY,PLDATA)                         TWQI177
C                                                                       TWQI178
C                                                                       TWQI179
C     NOW LABEL THE AXES ......                                         TWQI180
C     CHANGE DEFAULT SPACING OF TITLES TO THE AXES                      TWQI181
C                                                                       TWQI182
      PLDATA(24)=.30                                                    TWQI183
      PLDATA(26)=.75                                                    TWQI184
      CALL TITLEB('+  TIME (YEARS)+',PLDATA)                            TWQI185
      IF(OPTION(1).EQ.0)CALL TITLEL('+CUMM NSF WATER QUALITY INDEX+',   TWQI186
     1PLDATA)                                                           TWQI187
      IF(OPTION(1).NE.0)CALL TITLEL('+MULT NSF WATER QUALITY INDEX+',   TWQI188
     1PLDATA)                                                           TWQI189
C                                                                       TWQI190
C     PRINT GRAPH DESCRIPTION AT LOWER, RIGHT HAND SIDE OF GRAPH        TWQI191
C                                                                       TWQI192
      PLDATA(22)=3.0                                                    TWQI193
      PLDATA(23)=1.0                                                    TWQI194
      CALL GTITLE('+STORET STATION NO.+',PLDATA)                        TWQI195
      PLDATA(22)=4.6                                                    TWQI196
      CALL GTITLE(TOP,PLDATA)                                           TWQI197
C                                                                       TWQI198
C     ADVANCE GRAPH PAPER FOR NEXT STATION                              TWQI199
C                                                                       TWQI200
      CALL NXTFRM(PLDATA)                                               TWQI201
  432 STAT(1)=SPACE                                                     TWQI202
   22 READ(20,30,END=330) AGENCY,STAT,DESCRP                            TWQI203
 30   FORMAT(2A4,4A4,1X,30A4)                                           TWQI204
      MM=1                                                              TWQI205
      WRITE(6,40) STAT,DESCRP                                           TWQI206
 40   FORMAT('1STATION ',4A4,/,' ',30A4)                                TWQI207
      DO 60 I=1,8                                                       TWQI208
      READ(20,30,END=310) AGENCY,STAT,DESCRP                            TWQI209
      WRITE(6,50) DESCRP                                                TWQI210
 50   FORMAT(' ',30A4)                                                  TWQI211
      IF(I.EQ.2)GO TO 61                                                TWQI212
      GO TO 60                                                          TWQI213
   61 TOP(1)=SYMBOL(4)                                                  TWQI214
      TOP(2)=STAT(1)                                                    TWQI215
      TOP(3)=STAT(2)                                                    TWQI216
      TOP(4)=SPACE                                                      TWQI217
      TOP(5)=DESCRP(17)                                                 TWQI218
      TOP(6)=DESCRP(18)                                                 TWQI219
      TOP(7)=DESCRP(19)                                                 TWQI220
      TOP(8)=DESCRP(20)                                                 TWQI221
      TOP(9)=DESCRP(21)                                                 TWQI222
      TOP(10)=DESCRP(22)                                                TWQI223
      TOP(11)=DESCRP(23)                                                TWQI224
      TOP(12)=SYMBOL(4)                                                 TWQI225
C     ****************************************************************** TWQI226
C                                                                       TWQI227
C     ADVANCE 'ISEQ' FOR NEXT STATION ...                               TWQI228
C                                                                       TWQI229
C     ****************************************************************** TWQI230
      ISEQ=ISEQ+1                                                       TWQI231
 60   CONTINUE                                                          TWQI232
      IF(OPTION(1).EQ.0)WRITE(6,51)                                     TWQI233
      IF(OPTION(1).NE.0)WRITE(6,52)                                     TWQI234
   51 FORMAT(//,31X,'CUMM')                                             TWQI235
   52 FORMAT(//,31X,'MULT')                                             TWQI236
      WRITE(6,70)                                                       TWQI237
 70   FORMAT('   DATE     DIG. YR.    TIME    WQI')                     TWQI238
 80   CONTINUE                                                          TWQI239
      DO 90 I=1,9                                                       TWQI240
      QUAL(I)=0.0                                                       TWQI241
 90   CONTINUE                                                          TWQI242
C     ****************************************************************** TWQI243
C                                                                       TWQI244
C     READ STATION PARAMETRIC DATA                                      TWQI245
C                                                                       TWQI246
C     ****************************************************************** TWQI247
  100 READ(20,110,END=310) AGENCY,STAT,IYR,IMON,IDAY,TIME,PARAM         TWQI248
  110 FORMAT(2A4,3A4,A3,2X,3I2,A4,10A4)                                 TWQI249
      IF (IYR.EQ.99) GOTO 232                                           TWQI250
      DO 120 I=1,9                                                      TWQI251
C     ****************************************************************** TWQI252
C                                                                       TWQI253
C     TEST FOR DUMMY VALUE IF NO SAMPLE WAS TAKEN                       TWQI254
C                                                                       TWQI255
C     ****************************************************************** TWQI256
      IF ((PARAM(I).LT.1E-15).AND.(PARAM(I).GT.0.)) GOTO 100            TWQI257
      IF (PARAM(I).GE.0.) GOTO 120                                      TWQI258
      WRITE(6,115) I,PARAM(I)                                           TWQI259
115   FORMAT(' ***WARNING - PARAMETER ',I1,' IS NEGATIVE, ',F3.1        TWQI260
     1,' IS SUBSTITUTED***')                                            TWQI261
  120 CONTINUE                                                          TWQI262
      IF (TIME.EQ.SKPTIM) TIME=SPACE                                    TWQI263
C     ****************************************************************** TWQI264
C                                                                       TWQI265
```

PROGRAM A - SOURCE LISTING

```
C     TEST PARAMETERS FOR MINIMUM POSSIBLE VALUES  -- IF LESS ADJUST
C
C     *****************************************************************
      DO 156 I=1,9
      IF (PARAM(I).LT.SMALL(I)) PARAM(I)=SMALL(I)
156   CONTINUE
      IF(EQTEMP(IMON)-PARAM(7).LT.-5)PARAM(7)=-5.0
C     *****************************************************************
C
C     COMPUTE SATURATION LEVEL OF OXYGEN AT STATION  --USING TEMPERATURE
C     AND CHLORIDE CONCENTRATION
C
C     *****************************************************************
      DOSAT=(1.-.000009*PARAM(10))*(14.652-.41022*PARAM(7)
     1+.007991*PARAM(7)**2 -.000077774*PARAM(7)**3)
C     *****************************************************************
C
C     COMPUTE OXYGEN CONCENTRATION AS PERCENT SATURATION
C
C     *****************************************************************
       PARAM(1)=PARAM(1)/DOSAT*100.
C     *****************************************************************
C
C     COMPUTE DEVIATION FROM EQUILIBRIUM TEMPERATURE
C
C     *****************************************************************
      PARAM(7)=EQTEMP(IMON)-PARAM(7)
C     *****************************************************************
C
C     ADD CONSTANT OF '5' TO TEMPERATURE VALUES -- NOTE - THIS IS DONE
C     TO ELIMINATE NEGATIVE TEMPERATURES IN UNIT QUALIGRAM
C     X-SCALE OF TEMPERATURE QUALIGRAM HAS ALSO BEEN CHANGED ACCORDINGLY
C
C     *****************************************************************
      PARAM(7)=PARAM(7)+5.
C     *****************************************************************
C
C     SEARCH FOR QUALITY VALUE --  LINEARLY INTERPOLATE IF NECESSARY
C
C     *****************************************************************
      DO 285 IPARAM=1,9
      MAX=MAXX(IPARAM)
      DO 157  ISCAN=1,MAX
      IF(PARAM(IPARAM).GT.TABLE(ISCAN,1,IPARAM))GO TO 157
      IF(PARAM(IPARAM).LT.TABLE(ISCAN,1,IPARAM))GO TO 158
      QUAL(IPARAM)=TABLE(ISCAN,2,IPARAM)
      GO TO 285
  157 CONTINUE
C     *****************************************************************
C
C     SET QUALITY OF PARAMETER FOR VALUE ABOVE DEFINED MAXIMUM
C
C     *****************************************************************
```

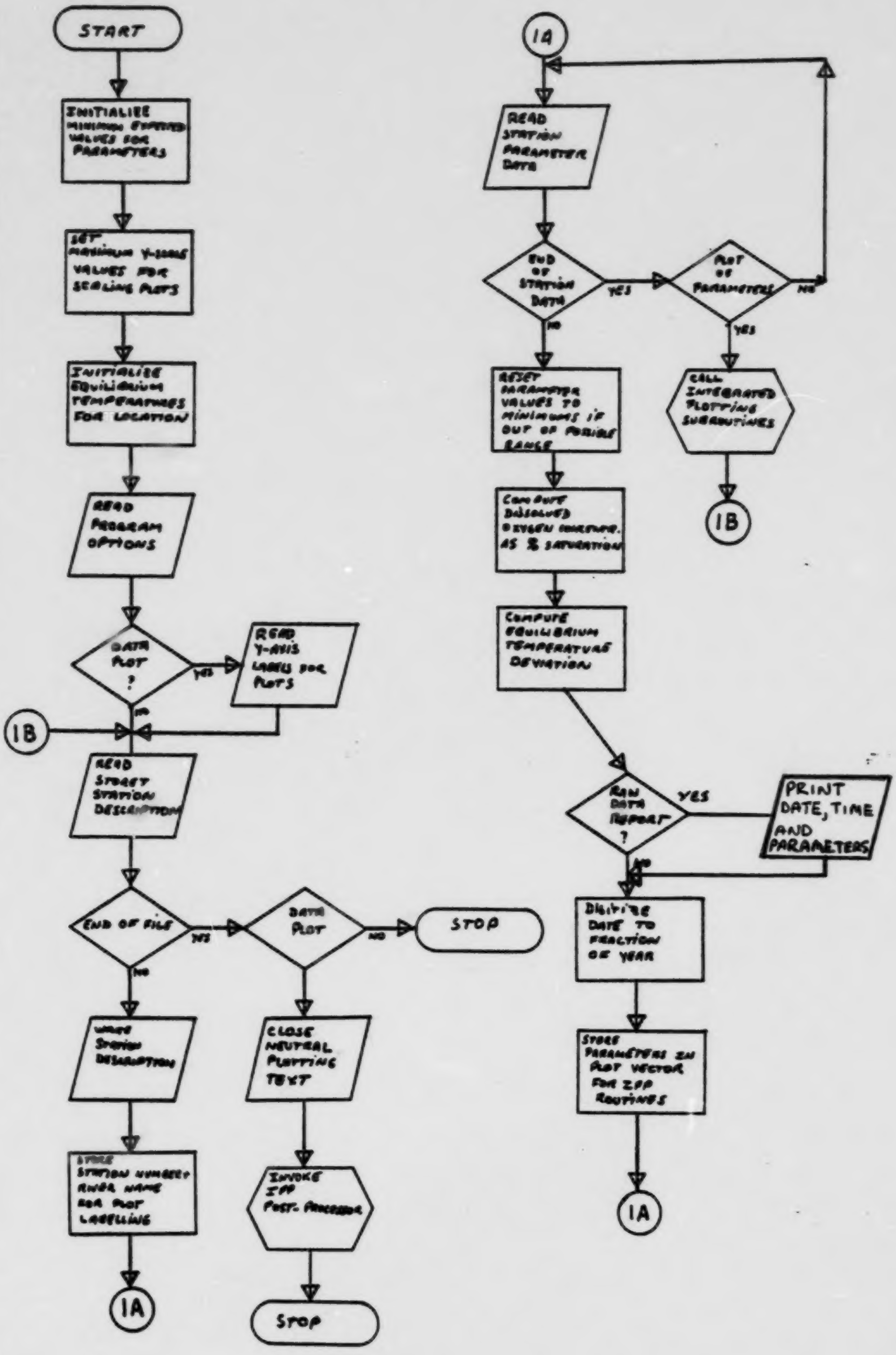
```
      QUAL(IPARAM)=QMAX(IPARAM)
      GO TO 285
C     ******************************************************************
C
C     PARAMETER IS BETWEEN TWO VALUES -- LINEARLY INTERPOLATE FOR UNIT
C     QUALITY BY USING THE HIGH VALUE AND SUBTRACTING THE DIFFERENCE
C
C     ******************************************************************
  158 XDIF=TABLE(ISCAN,1,IPARAM)-PARAM(IPARAM)
      XDELTA=TABLE(ISCAN,1,IPARAM)-TABLE(ISCAN-1,1,IPARAM)
      SLOPE=(TABLE(ISCAN,2,IPARAM)-TABLE(ISCAN-1,2,IPARAM))/XDELTA
      QUAL(IPARAM)=TABLE(ISCAN,2,IPARAM)-(SLOPE*XDIF)
285   CONTINUE
      WQIA=0.
C     ******************************************************************
C
C     TEST OPTION OF MULTIPLICATIVE OR ADDITIVE INDEX
C
C     ******************************************************************
      IF(OPTION(1).GT.0)GO TO 275
      DO 290 I=1,9
      WQIA=WQIA+QUAL(I)*WEIGHT(I)
290   CONTINUE
      GO TO 278
  275 WQIA=1.0
      DO 276  I=1,9
      WQIA=WQIA*QUAL(I)**WEIGHT(I)
  276 CONTINUE
C     ******************************************************************
C
C     DIGITIZE SAMPLE DATE TO FRACTION OF YEAR
C
C     ******************************************************************
  278 SUM=0.
      IF (IMON.EQ.1) GOTO 675
      INDEX=IMON-1
      DO 670 I=1,INDEX
      SUM=SUM+DAYS(I)
670   CONTINUE
675   CONTINUE
      SUM=SUM+IDAY
      IF ((MOD(IYR,4).EQ.0).AND.(IMON.GT.2)) SUM=SUM+1
      TOTDAY=365
      IF (MOD(IYR,4).EQ.0) TOTDAY=366
      FRAC=SUM/TOTDAY
      WRITE(6,300) IMON,IDAY,IYR,FRAC,TIME,WQIA
300   FORMAT(' ',I2,'/',I2,'/',I2,4X,F5.3,5X,A4,3X,F4.0)
C     ******************************************************************
C
C     SAVE DATE AND WQI FOR PLOTTING OR FOR DISK STATION FILE
C
C     ******************************************************************
  191 XXVAL(MM)=IYR+FRAC
```

```
      YYVAL(MM)=WQIA
C     ******************************************************************
C
C     SAVE HIGHEST VALUE OF Y-VALUES FOR SCALING PLOT
C
C     ******************************************************************
      IF(YYVAL(MM).GT.YYMAX)YYMAX=YYVAL(MM)
C     ******************************************************************
C
C     SAVE HIGHEST OF YEARS FOR SCALING PLOT
C
C     ******************************************************************
      IF(XXVAL(MM).GT.XXMAX)XXMAX=XXVAL(MM)
C     ******************************************************************
C
C     SAVE RECORD ON DISK FILE IF PLOTTING WQI BY STATION
C
C     ******************************************************************
      IF(OPTION(3).GT.0)WRITE(25,91)IYR,IMON,IDAY,OPTION(1),STAT,ISEQ
     1,XXVAL(MM),YYVAL(MM),TOP
   91 FORMAT(3I2,I2,4A4,I3,2F12.4,12A4)
      MM=MM+1
  192 GO TO 100
310   CONTINUE
      WRITE(6,320) STAT
320   FORMAT(//,' ABNORMAL FILE END WHILE READING STATION ',4A4)
      STOP
400   WRITE(6,112)
  112 FORMAT(10X,'BEGINNING OF DATA RECORDS NOT CONFIRMED')
  330 IF(OPTION(2).LE.0)GO TO 333
C     ******************************************************************
C
C     PLOTTING IS FINISH  -- NOW CLOSE THE NEUTRAL TEXT
C
C     ******************************************************************
      CALL PPPEND(PLDATA)
  333 IF(OPTION(3).GT.0)END FILE 25
C     ******************************************************************
C
C     IF NOT PLOTTING SET HI COND CODE TO  BYPASS PLOT POST-PROCESSOR
C
C     ******************************************************************
      IF(OPTION(2).LE.0) STOP 40
      CALL EXIT
      END
```

PROGRAM B: PLOT/PRINT NSF - WQI PARAMETER DATA

This program works quite similar to program A; but instead of computing the WQI, the data for the index is saved in a nine element two dimensional array. The plotting for all the data is done in two frames, by placing five parameters on each frame. As presently written each frame is 8 ½ x 11 inches and due to the high resolution required, it can only be satisfactorily produced on the calcomp plotter. The scale factors for all parameters are set at specified values for ease in comparisons. In applying this program to the State of New Jersey we found two extremes in total dissolved solids concentrations and therefore two sets of scales are used for this parameter.

PLOT/PRINT NSF-WQI PARAMETER DATA - PROGRAM FLOWCHART


START
INITIALIZE MINIMUM EXPECTED VALUES FOR PARAMETERS
SET MAXIMUM Y-SCALE VALUES FOR SCALING PLOTS
INITIALIZE EQUILIBRIUM TEMPERATURES FOR LOCATION
READ PROGRAM OPTIONS
DATA PLOT ?
YES
NO
READ Y-AXIS LABELS FOR PLOTS
1B
READ STORET STATION DESCRIPTION
END OF FILE
YES
NO
DATA PLOT
NO
STOP
WRITE STATION DESCRIPTION
STORE STATION NUMBER & RIVER NAME FOR PLOT LABELLING
1A
CLOSE NEUTRAL PLOTTING TEXT
INVOKE ZPP POST- PROCESSOR
STOP
1A
READ STATION PARAMETER DATA
END OF STATION DATA
YES
NO
PLOT OF PARAMETERS
NO
YES
CALL INTEGRATED PLOTTING SUBROUTINES
1B
RESET PARAMETER VALUES TO MINIMUMS IF OUT OF POSSIBLE RANGE
COMPUTE DISSOLVED OXYGEN CONCENTR. AS % SATURATION
COMPUTE EQUILIBRIUM TEMPERATURE DEVIATION
RAW DATA REPORT ?
YES
NO
PRINT DATE, TIME AND PARAMETERS
DIGITIZE DATE TO FRACTION OF YEAR
STORE PARAMETERS IN PLOT VECTOR FOR ZPP ROUTINES
1A

PROGRAM B - PLOT/PRINT NSF-WQI PARAMETER DATA

PROGRAM INPUT

1) PROGRAM OPTIONS

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 2	IPRNT	I2	Set > 0, to produce report of WQI Parameter Data
3 - 4	IPLOT	I2	Set > 0, to plot 5 parameters/frame of above data

2) Y-AXIS PARAMETER LABEL (IF IPLOT > 0)

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 20	PTITLE (1,1-5)	5A4	y-axis label for first parameter in character balanced notation (see sample input in next section or reference 2)
1 - 20	PTITLE (2,1-5)	5A4	y-axis label for 2nd parameter
.	.	.	.
.	.	.	.
.	.	.	.
1 - 20	PTITLE (9,1-5)	5A4	y-axis label for 9th parameter

note: The titles above must be in the same sequence as the parameters were specified on the STORET retrieval.

3) STORET "MORE = 3" RETRIEVAL

This retrieval must have preceded as a separate step or as a separate job altogether. In this program it will be referred as input file (20). See deck setup following this section for details.

SAMPLE INPUT

1) EXECUTION OF PROGRAM FROM SOURCE STATEMENTS:

```
//EPAIII   JOB ('AAAA')
//STEP1 EXEC IPP906G
//FORT.SYSIN DD *
                    .                         .
                    .                         .
                    .                         .
                     SOURCE DECK GOES HERE
                    .                         .
                    .                         .
                    .                         .
//GO.FT20F001 DD DSN=(FILE NAME FROM STORET RETRIEVAL GOES HERE),
// UNIT=3330-1,DISP=OLD,LABEL=(,,,IN)
//GO.FT08F001 DD *
0101
/D.O.  PERCENT SAT/
+FECAL COLI  MPN/ML+
/      PH       /
+    BOD5  MG/L  +
+     NO3  MG/L  +
+     PO4  MG/L  +
/EQUIL TEMP DELTA /
/  TURBIDITY   JTU/
+ TOT SOLIDS  MG/L+

//PLOT.FT07F001 DD SYSOUT=(K,,6129)
```

2) EXECUTION OF PROGRAM FROM LOAD MODULE:

```
//EPAIII   JOB ('AAAA')
//STEP1 EXEC PGM=WQI5PARM,REGION=150K
//STEPLIB DD DSN=CN.EPAGAN.R2TW.WQMODL,DISP=SHR
//FT01F001 DD DDNAME=SYSIN,DCB=BLKSIZE=80
//FT06F001 DD SYSOUT=A
//FT07F001 DD SYSOUT=B
//FT16F001 DD SYSOUT=B
//FT15F001 DD SYSOUT=A
//FT02F001 DD DSN=&IPPTAPE,UNIT=SYSDA,SPACE=(CYL,(1,1),RLSE),
// DCB=(RECFM=VSB,LRECL=516,BLKSIZE=3156,DSORG=PS),
// DISP=(NEW,PASS,DELETE)
//FT20F001 DD DSN=(FILE NAME FROM STORET RETRIEVAL GOES HERE),
// UNIT=3330-1,DISP=OLD,LABEL=(,,,IN)
//FT08F001 DD *
0101
/D.O.  PERCENT SAT/
+FECAL COLI  MPN/ML+
/      PH       /
+    BOD5  MG/L  +
+     NO3  MG/L  +
+     P04  MG/L  +
/EQUIL TEMP DELTA /
/  TURBIDITY   JTU/
+ TOT SOLIDS  MG/L+

//STEP2 EXEC PGM=CMP906A,REGION=100K,COND=(8,LE)
//STEPLIB DD DSN=CN.EPACAW.SASS.IPP.LODMOD,DISP=SHR
//FT01F001 DD DDNAME=SYSIN,DCB=BLKSIZE=80
//FT02F001 DD DSN=&IPPTAPE,DISP=(OLD,DELETE,DELETE)
//FT06F001 DD SYSOUT=A
//FT07F001 DD SYSOUT=(K,,6129)
//FT10F001 DD DUMMY
//FT15F001 DD SYSOUT=A
//FT03F001 DD DDNAME=PLOTTAPE
//PLOTTAPE DD SYSOUT=B
```

PROGRAM B: PLOT/PRINT NSF - WQI PARAMETER DATA

SAMPLE OUTPUT

```
STATION 343016
                                                                    343016          87
                                                                   40 33 34.0 074 31 41.0 2
                                                                   RARITAN RIVER
                                                                   34035    NEW JERSEY
                                                                   NORTHEAST                013391
                                                                   LOWER HUDSON N.Y. METROPOLITAN AREA
 /TYPA/AMBNT/STREAM                                                21NJDEP1            04001004
                                                                    0000 FEET  DEPTH  CLASS 00
       DATE     TIME    D O (SAT)   F.C. MPN        PH         BOD5         NO3          PO4      TEMP DELTA    TURB    TOT SOLIDS       CL
     10/10/66              55.6480  9180.0000     7.2000      4.0000       0.6000       0.5000     -2.7443     20.5000    798.0000      0.0000
      1/17/67              96.8442 16090.0000     6.9000      5.0000       1.4400       0.5000     -0.4444      8.6000    344.0000      0.0000
      5/24/67              82.7172 24000.0000     7.4000      5.0000       0.5400       0.3000      5.5557     12.4000    356.0000      0.0000
      9/11/67              71.2497  2400.0000     7.4000      7.0000       0.5100       1.1000      4.7780      8.6000    446.0000      0.0000
     10/23/67              67.9343 24000.0000     7.2000      7.0000       1.0000       1.3000      3.5557     22.0000    655.0000      0.0000
      2/ 4/69              76.4631240000.0000     7.2000     10.0000       3.0000       2.0000      0.7778    125.0000    408.0000      0.0000
      5/14/69              59.0895240000.0000     7.2000     11.0000       1.0000       1.0000      4.5557     36.0000    533.0000      0.0000
     12/ 3/69              76.8997 91800.0000     7.4000     10.0000       1.0000       0.0        -0.6666     43.0000    445.0000      0.0000
      2/18/70              94.3315 22100.0000     6.9000      4.0000       2.0000       4.0000      0.2778     25.0000    291.0000      0.0000
      4/23/70              87.4771 24000.0000     7.4000      2.0000       1.0000       0.0         1.8890     16.0000    246.0000      0.0000
     10/ 7/70              75.9977  1720.0000     7.2000     10.0000       2.0000       1.0000     -1.4443     10.0000    854.0000      0.0000
      2/ 4/71              84.2123  2300.0000     7.3000     11.0000       5.0000       1.0000      1.7778     30.0000    426.0000      0.0000
      4/26/71              91.7934    50.0000     8.0000      4.0000       3.0000       1.0000      2.8890     16.0000    354.0000      0.0000
      8/17/71              79.1900 16000.0000     7.3000      4.0000       6.0000       1.3000      3.2224      9.0000    460.0000      0.0000
     11/11/71              81.3075   540.0000     7.5000      3.0000       3.0000       0.3800      2.7778      9.0000    306.0000      0.0000
      2/14/72              84.9141  2400.0000     6.9000      4.0000       4.0000       0.5000      1.7778    130.0000    270.0000      0.0000
      5/ 9/72              93.3444  2400.0000     7.1000      4.0000       2.0000       1.0000      7.5557     88.0000    218.0000      0.0000
      1/11/73              83.2651     5.0000     7.1000      5.0000       2.0000       0.5600      0.5556     17.0000    262.0000      0.0000
      3/27/73              83.1594     2.0000     6.8000      2.0000       1.0000       0.7000      0.2223     65.0000    210.0000      0.0000
      9/27/73              45.7884    34.0000     7.3000      3.0000       1.2000       1.5000     21.0779      8.0000    616.0000      0.0000
     12/13/73              82.9552   540.0000     7.4000      4.0000       1.8000       1.0000      1.3334     16.0000    210.0000      0.0000
```

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```
STATION 343017
                                                                                343017          88
                                                                               40 29 50.0 074 26 18.0 2
                                                                               RARITAN RIVER (R17)
                                                                               34023   NEW JERSEY
                                                                               NORTHEAST                    013391
                                                                               LOWER HUDSON N.Y. METROPOLITAN AREA
/TYPA/AMBNT/STREAM                                                             21NJDEP1              04001004
                                                                                0000 FEET  DEPTH  CLASS 00

       DATE    TIME   D O (SAT)   F.C. MPN        PH         BOD5         NO3          PO4      TEMP DELTA    TURB    TOT SOLIDS        CL
     10/10/66           62.4780   330.0000      7.3000      6.0000      1.2400      0.4000      -2.2443    24.5000   523.0000      0.0000
      1/17/67           95.6182 16090.0000      7.9000      4.0000      0.9200      0.9000      -2.4444    17.0000   253.0000      0.0000
      5/24/67           91.6987  9180.0000      7.4000      5.0000      0.8000      0.2000       5.0557     6.6000   280.0000      0.0000
      9/11/67           70.5822 16090.0000      7.3000      6.0000      1.2800      0.9000       3.7780     6.3000   361.0000      0.0000
     10/23/67           64.3165 24000.0000      7.3000      6.0000      1.0000      0.9000       1.5557    26.0000   404.0000      0.0000
      3/ 5/68           81.4680 24000.0000      7.2000      9.0000      1.0000      0.0          3.2223    15.0000   292.0000      0.0000
      2/ 4/69           84.2123 24000.0000      7.3000      8.0000      2.0000      2.0000       1.7778   140.0000   381.0000      0.0000
      5/14/69          126.5480 24000.0000      7.4000      5.0000      1.0000      1.0000       2.5557    17.0000   392.0000      0.0000
     12/ 3/69           74.8414  2300.0000      7.4000      4.0000      1.0000      0.0         -1.1666    12.0000   850.0000      0.0000
     10/ 7/70           65.1528   490.0000      7.4000      6.0000      4.0000      0.0         -3.4443    10.0000  1838.0000      0.0000
      4/26/71           91.7934    50.0000      7.9000      4.0000      3.0000      1.0000       2.8890    15.0000   326.0000      0.0000
      8/17/71          152.0962   170.0000      7.7000      4.0000      6.0000      0.9000       1.2224    16.0000   450.0000      0.0000
     11/11/71           81.0493   130.0000      7.6000      2.0000      4.0000      0.5400       1.7778    16.0000   272.0000      0.0000
      2/14/72           84.9141  2400.0000      6.9000      5.0000      4.0000      0.4800       1.7778   120.0000   274.0000      0.0000
      3/27/73           89.6095     2.0000      6.9000      2.0000      1.5000      0.5000      -2.7777    54.0000   204.0000      0.0000
      9/27/73           47.8543   240.0000      7.3000      2.0000      2.0000      1.2000       4.7780     6.0000   532.0000      0.0000
     12/13/73           85.1193  1600.0000      7.4000      3.0000      1.4000      0.5000       1.3334    17.0000   206.0000      0.0000
```

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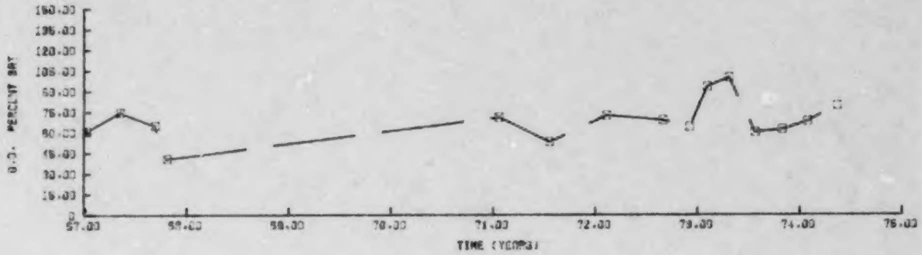
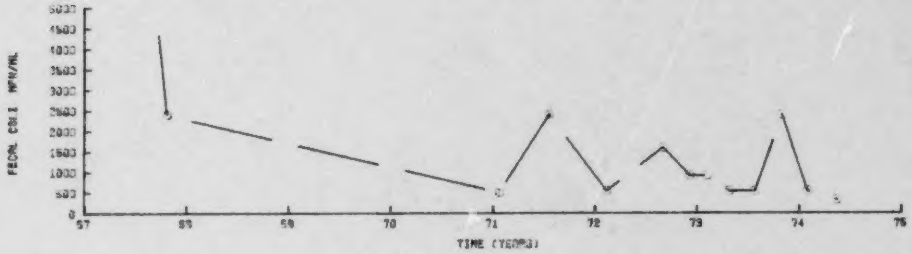
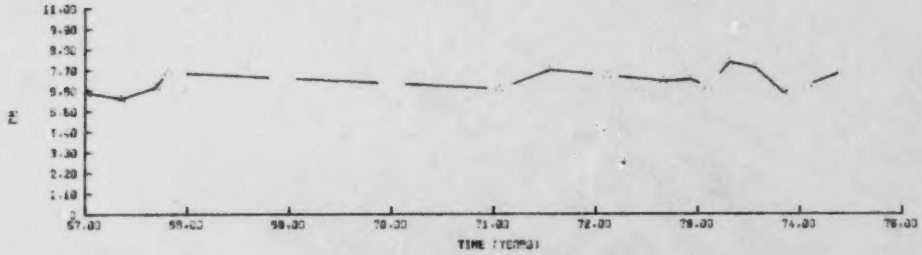
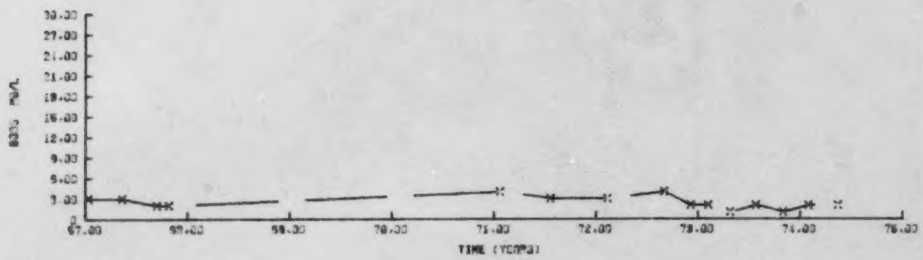
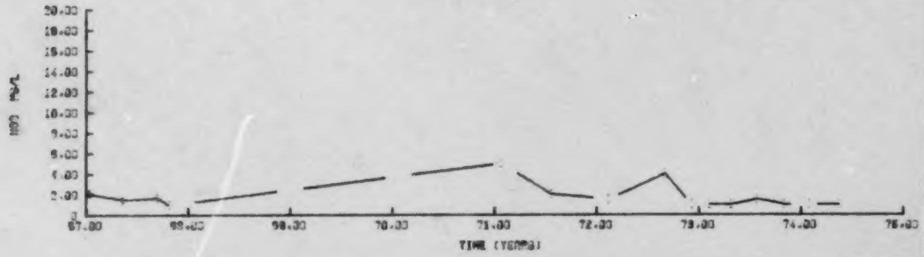
STORET STATION NO. 343024 RARITAN RIVER











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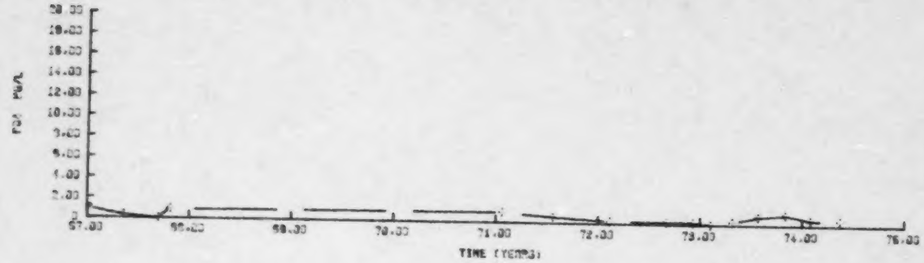
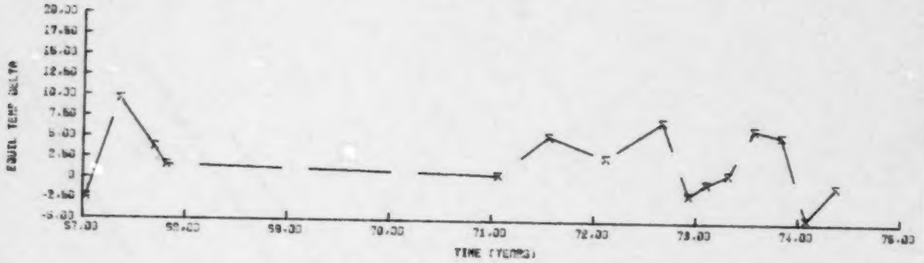
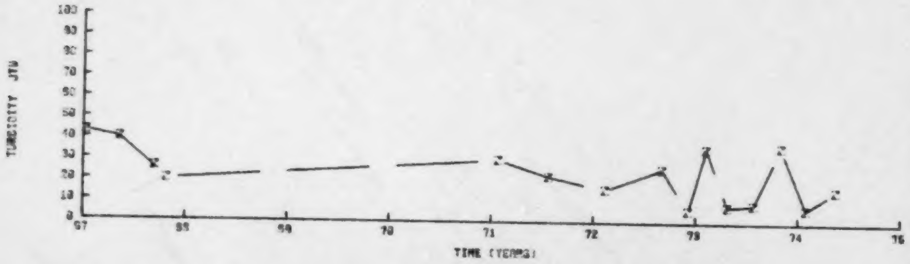
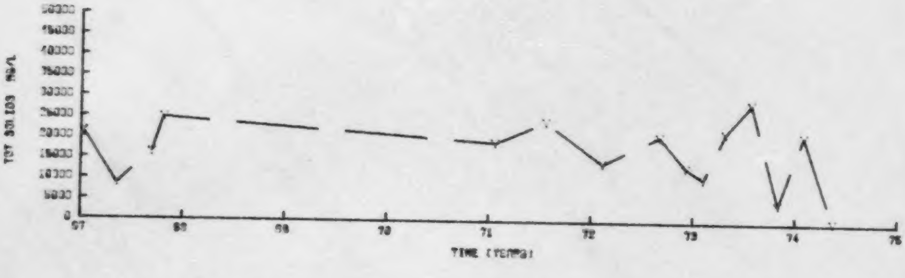
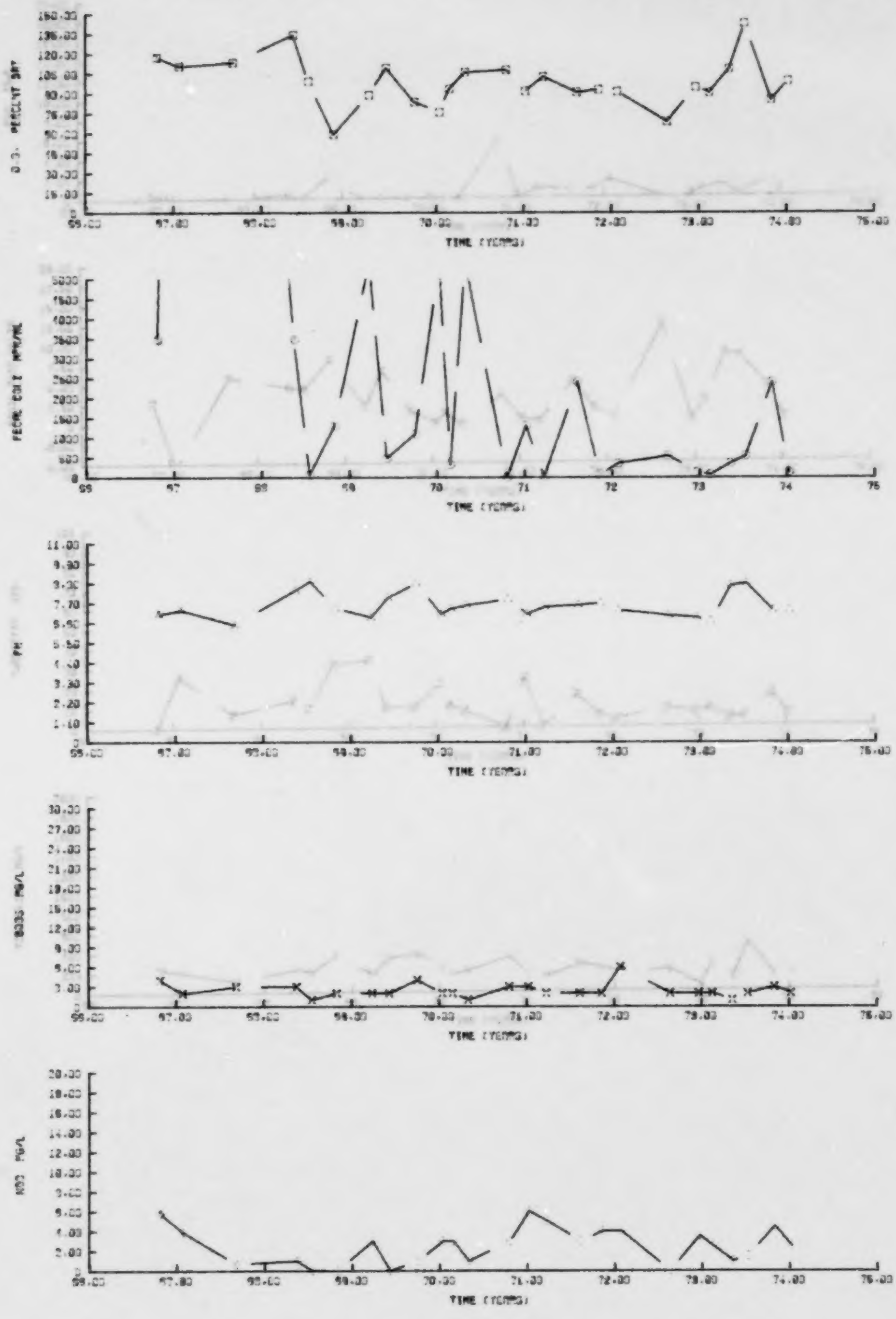








STORET STATION NO. 343062 RARITAN RIVER S. BRANCH



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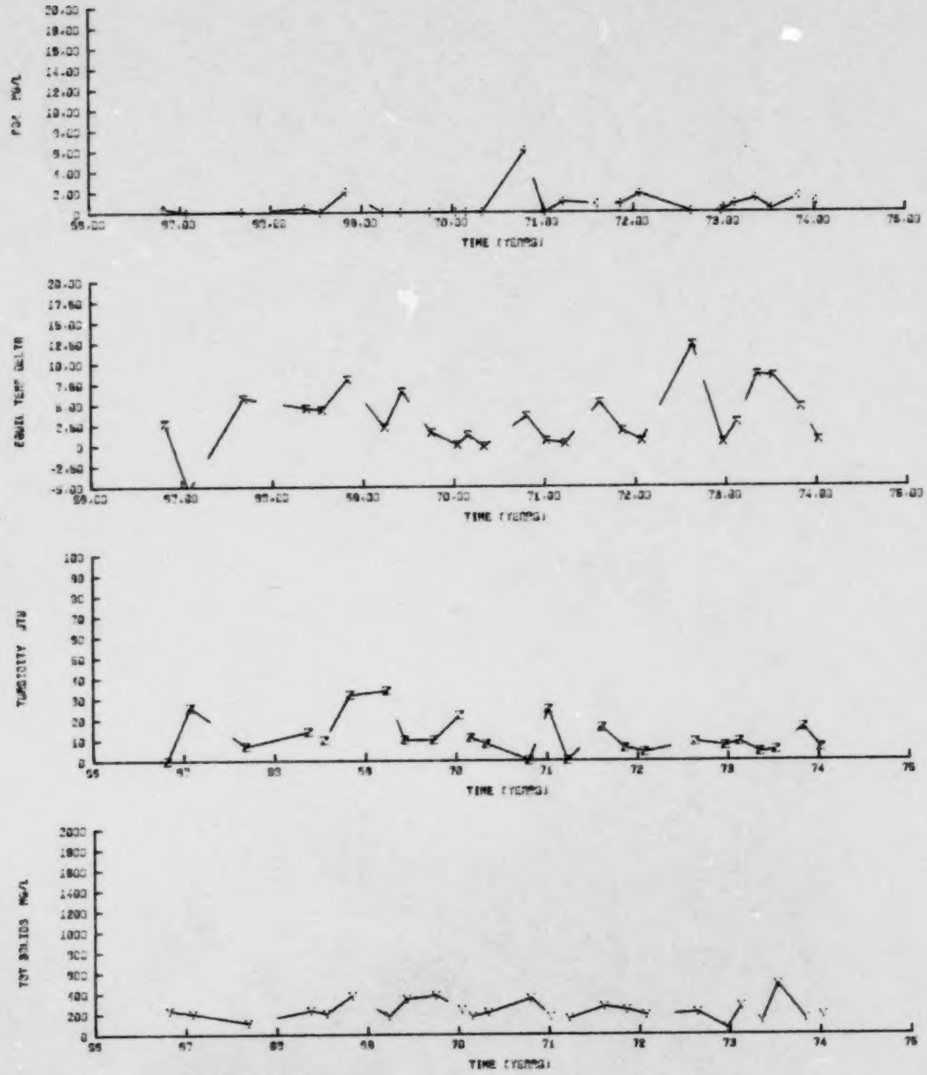


PROGRAM B SOURCE LISTING

```
C     ******************************************************************
C     *******************************************************************
C
C     THIS PROGRAM PLOTS AND/OR PRINTS THE RAW DATA USED TO COMPUTE
C     THE WQI AT STORET STATIONS, FOR THE RETRIEVED TIME INTERVAL
C
C     *** THIS VERSION PLOTS UP TO FIVE PARAMETERS PER FRAME ***
C
C     *******************************************************************
C     ******************************************************************
C
      DIMENSION PLDATA(30),SYMBOL(14),XXVAL(100),SCL(5),YYVAL(100)
      DIMENSION TOP(12),HIGHY(9),PTITLE(9,5),YTITLE(5),VAL(9,100)
      DIMENSION AGENCY(2),DESCRP(30),EQTEMP(12),PARAM(10),SMALL(9),
     1STAT(4),DAYS(12)
      DATA DAYS/31.,28.,31.,30.,31.,30.,31.,31.,30.,31.,30.,31./
      DATA SMALL/0.,1.,2.,0.,0.,0.,-10.,0.0,0.0/
      DATA HIGHY/150., 5000.,11.,30.,20.,20.,20.,100.,50000./
      DATA SKPTIM/'2500'/,SPACE/'    '/
      DATA SYMBOL/'Q','O','T','X','D','A','M','Z','Y','B','*','H','I'/
C     *******************************************************************
C
C     THESE VALUES ARE MONTHLY EQUILIBRIUM TEMPERATURES FOR THE
C     STATE OF NEW JERSEY   REF: 'EFFECT OF GEOGRAPHICAL LOCATION ON
C     COOLING POND REQUIREMENT AND PERFORMANCE 16130 FDQ 03/71
C
C     ******************************************************************
      DATA EQTEMP/33.,37.,45.,57.,69.,78.,83.,81.,73.,60.,46.,38./
      M=8
C
      READ(M,1)IPRNT,IPLOT
    1 FORMAT(2I2)
C     ******************************************************************
C
C     READ Y-AXIS PARAMETER LABEL TO ARRAY IF PLOTING
C
C     ******************************************************************
      IF(IPLOT.GT.0)READ(M,4)((PTITLE(L,JX),JX=1,5),L=1,9)
    4 FORMAT(5A4)
      KK=0
      XXMAX=0.0
      YYMAX=0.0
C     ******************************************************************
C
C **READ DELIMITER RECORD - VERIFY BEGINNING OF DATA RECORDS**
C
C     ******************************************************************
 12   READ(20,111,END=400) IDUMMY
  111 FORMAT(25X,I2)
      IF (IDUMMY.EQ.99) GOTO 22
      GOTO 12
C
```

```
C     ****************************************************************
C     *** COMMANDS BELOW USE THE INTEGRATED PLOTTING PACKAGE ***
C
C     ****************************************************************
  232 IF(IPLOT.LE.0)GO TO 100
      HINIT=10.75
      LN=1
C     ****************************************************************
C
C     THIS NEXT CALL IS REQUIRED FOR PLOTS LARGER THAN 10.5 INCHES...
C
C     ****************************************************************
      CALL CMLBF('PLOT IS 8-1/2 X 11 IN ')
C
C     SET INITIAL VALUES ON SPECIFICATIONS ARRAY
C
      CALL SSPECS(PLDATA)
      H17=PLDATA(17)/2.
      H18=PLDATA(18)/2.
C
C     ENTER NUMBER OF DATA POINTS TO PLOT
C
      PLDATA(13)=MM-1
C
C     MOVE Y-AXIS 1.5 INCHES AWAY FROM THE FRAME ORIGIN
C
      PLDATA(1)=1.5
C
C     RESET SIZE OF AXES (INCHES)
C
      PLDATA(7)=6.0
      PLDATA(8)=1.5
      DO 2  L=1,9
C
C     SET PLOTTING SYMBOL DESIRED
C
      PLDATA(16)=SYMBOL(L)
C
C     SET LETTER SIZE OF LABELS TO HALF DEFAULT (.05)
C
      PLDATA(17)=H17
      PLDATA(18)=H18
C
C     MOVE X-AXIS 8.75 INCHES AWAY FROM ORIGIN - USING 2.0 INCHES FOR
C     EACH GRAPH FOR A TOTAL FRAME SIZE OF 8-1/2 X 11 INCHES
C
      PLDATA(2)=HINIT-(LN*2.0)
C
C     CLEAR WORK AREA
C
      DO 15  K=1,5
   15 SCL(K)=0.0
C
C     SET RANGE OF VALUES ON X-AXIS ** NO. DIVISIONS=NO.YEARS ANALYZED
C
```

```
      KK=XXMAX+1
      PLDATA(3)=KK
      KK2=XXVAL(1)
      PLDATA(4)=KK2
      PLDATA(9)=KK-KK2
C
C     SET RANGE OF VALUES ON Y-AXIS
C
      PLDATA(5)=HIGHY(L)
C
C     TEST SOLIDS AMOUNT AT STATION -- RESET Y-SCALE IF NECESSARY
C
      IF(L.EQ.9.AND.VAL(9,1).LT.1000)PLDATA(5)=2000.
      PLDATA(6)=0.0
C
C     FOR TEMPERATURE CHANGE -- Y-SCALE MUST ACCOMODATE NEGATIVE VALUES
C
      IF(L.EQ.7)PLDATA(6)=-5.0
C
C     SET NO. OF DECIMALS ON Y-AXIS DEPENDING ON PARAMETER ...
C
      PLDATA(28)=2.0
      IF(L.EQ.2.OR.L.EQ.8.OR.L.EQ.9)PLDATA(28)=0.0
C
C     CHANGE DEFAULT VALUE OF DIVISIONS FOR Y-AXIS
C
      PLDATA(10) = 10.
C
C     CLEAR ZONES -- UPDATED BY TITLES ON PREVIOUS GRAPH
C
      CALL ZZONES(PLDATA)
C
C     DRAW  X-Y  AXES
C
      CALL AXLILI(PLDATA)
C
C     DRAW ANNOTATION NUMBERS AT THE BOTTOM SCALE MARKS
C
      CALL NODLIB(PLDATA)
C
C     DRAW ANNOTATION NUMBER AT THE LEFT SCALE MARKS
C
      CALL NODLIL(PLDATA)
C
C     CLEAR ZONES VARIABLES --  SINCE UPDATED BY ABOVE SUBROUTINE
C
      CALL ZZONES(PLDATA)
C
C     PLOT SYMBOL AT DATA POINT LOCATIONS
C
      KK=MM-1
      DO 6  K=1,KK
      YYVAL(K)=VAL(L,K)
    6 CONTINUE
      CALL PSLILI(XXVAL,YYVAL,PLDATA)
```

```
C
C     NOW CONNECT DATA POINTS WITH DASHED LINE
C
      CALL DLLILI(XXVAL,YYVAL,PLDATA)
C
C     CHANGE DEFAULT SPACING OF TITLES TO THE AXES
C
      PLDATA(24)=.15
      PLDATA(26)=.45
C     ******************************************************************
C
C     NOW LABEL THE AXES ......
C
C     ******************************************************************
      CALL TITLEB('+  TIME (YEARS)+',PLDATA)
C
C     MOVE APPROPIATE Y-AXES LABEL TO VECTOR FOR PLOTTING
C
      DO 8 JX=1,5
      YTITLE(JX)=PTITLE(L,JX)
    8 CONTINUE
      CALL TITLEL(YTITLE,PLDATA)
      IF(L.NE.5)GO TO 24
C
C     RESTORE TEXT LETTER SIZE FOR STATION DESCRIPTION LABEL
C
      PLDATA(17)=H17*2.
      PLDATA(18)=H18*2.0
C
C     PRINT GRAPH DESCRIPTION AT UPPER, RIGHT HAND SIDE OF GRAPH
C
      PLDATA(22)=1.75
      PLDATA(23)=10.50
      CALL GTITLE('+STORET STATION NO.+',PLDATA)
      PLDATA(22)=3.65
      CALL GTITLE(TOP,PLDATA)
C     ******************************************************************
C
C     ADVANCE GRAPH PAPER FOR NEXT FOUR PARAMETERS ...
C
C     ******************************************************************
      CALL NXTFRM(PLDATA)
      LN = 0
   24 LN=LN + 1
    2 CONTINUE
C
C     RESTORE TEXT LETTER SIZE FOR STATION DESCRIPTION LABEL
C
      PLDATA(17)=H17*2.
      PLDATA(18)=H18*2.0
C
C     PRINT GRAPH DESCRIPTION AT UPPER, RIGHT HAND SIDE OF GRAPH
C
      PLDATA(22)=1.75
      PLDATA(23)=10.50
      CALL GTITLE('+STORET STATION NO.+',PLDATA)
      PLDATA(22)=3.65
      CALL GTITLE(TOP,PLDATA)
C
C     ADVANCE GRAPH PAPER FOR NEXT STATION
C
      CALL NXTFRM(PLDATA)
  432 STAT(1)=SPACE
   22 READ(20,30,END=330) AGENCY,STAT,DESCRP
 30   FORMAT(2A4,4A4,1X,30A4)
      MM=1
      IF(IPRNT.GT.0) WRITE(6,40) STAT,DESCRP
 40   FORMAT('1STATION ',4A4,/,' ',30A4)
      DO 60 I=1,8
      READ(20,30,END=310) AGENCY,STAT,DESCRP
      IF(IPRNT.GT.0) WRITE(6,50) DESCRP
 50   FORMAT(' ',30A4)
      IF(I.EQ.2.AND.IPLOT.GT.0)GO TO 61
      GO TO 60
   61 TOP(1)=SYMBOL(4)
      TOP(2)=STAT(1)
      TOP(3)=STAT(2)
      TOP(4)=SPACE
      TOP(5)=DESCRP(17)
      TOP(6)=DESCRP(18)
      TOP(7)=DESCRP(19)
      TOP(8)=DESCRP(20)
      TOP(9)=DESCRP(21)
      TOP(10)=DESCRP(22)
      TOP(11)=DESCRP(23)
      TOP(12)=SYMBOL(4)
 60   CONTINUE
C     PRINT HEADINGS IF PRINTING RAW DATA ...
      IF(IPRNT.GT.0)WRITE(6,5)
    5 FORMAT(    5X,'  DATE  ',2X,'TIME',3X,'D O (SAT)',3X,'F.C. MPN',
     16X,'PH',9X,'BOD5',7X,'NO3',8X,'PO4',6X,'TEMP DELTA',3X,'TURB',
     23X,'TOT SOLIDS',5X,'CL')
C     ********************************************************************
C
C     READ STATION PARAMETRIC DATA
C
C     ********************************************************************
  100 READ(20,110,END=310) AGENCY,STAT,IYR,IMON,IDAY,TIME,PARAM
  110 FORMAT(2A4,3A4,A3,2X,3I2,A4,10A4)
      IF (IYR.EQ.99) GOTO 232
      DO 120 I=1,9
C     ********************************************************************
C
C     TEST FOR DUMMY VALUE IF NO SAMPLE WAS TAKEN
C
C     ********************************************************************
      IF ((PARAM(I).LT.1E-15).AND.(PARAM(I).GT.0.)) GOTO 100
      IF (PARAM(I).GE.0.) GOTO 120
      WRITE(6,115) I,PARAM(I)
115   FORMAT(' ***WARNING - PARAMETER ',I1,' IS NEGATIVE, ',F3.1
     1,' IS SUBSTITUTED***')
  120 CONTINUE
      IF (TIME.EQ.SKPTIM) TIME=SPACE
C     *****************************************************************
C
C     TEST PARAMETERS FOR MINIMUM POSSIBLE VALUES  -- IF LESS ADJUST
C
C     *****************************************************************
      DO 156 I=1,9
      IF (PARAM(I).LT.SMALL(I)) PARAM(I)=SMALL(I)
156   CONTINUE
C     *****************************************************************
C
C     COMPUTE SATURATION LEVEL OF OXYGEN AT STATION  --USING TEMPERATURE
C     AND CHLORIDE CONCENTRATION
C
C     *****************************************************************
      DOSAT=(1.-.000009*PARAM(10))*(14.652-.41022*PARAM(7)
     1+.007991*PARAM(7)**2 -.000077774*PARAM(7)**3)
C     *****************************************************************
C
C     COMPUTE OXYGEN CONCENTRATION AS PERCENT SATURATION
C
C     *****************************************************************
       PARAM(1)=PARAM(1)/DOSAT*100.
C     *****************************************************************
C
C     COMPUTE DEVIATION FROM EQUILIBRIUM TEMPERATURE
C
C     *****************************************************************
      PARAM(7)=(EQTEMP(IMON)-32.)*.55556 - PARAM(7)
C     *****************************************************************
C
C     TEST OPTION TO PRINT RAW DATA ...
C
C     *****************************************************************
      IF(IPRNT.GT.0)WRITE(6,3)IMON,IDAY,IYR,TIME,(PARAM(I),I=1,10)
    3 FORMAT(5X,I2,'/',I2,'/',I2,3X,A4,10F11.4)
C     *****************************************************************
C
C     DIGITIZE SAMPLE DATE TO FRACTION OF YEAR
C
C     *****************************************************************
  278 SUM=0.
      IF (IMON.EQ.1) GOTO 675
      INDEX=IMON-1
      DO 670 I=1,INDEX
      SUM=SUM+DAYS(I)
670   CONTINUE
675   CONTINUE
      SUM=SUM+IDAY
      IF ((MOD(IYR,4).EQ.0).AND.(IMON.GT.2)) SUM=SUM+1
      TOTDAY=365
      IF (MOD(IYR,4).EQ.0) TOTDAY=366
      FRAC=SUM/TOTDAY
  191 XXVAL(MM)=IYR+FRAC
      DO 9  JX=1,9
      VAL(JX,MM)=PARAM(JX)
    9 CONTINUE
C     SAVE HIGHEST OF YEARS FOR SCALING PLOT
      IF(XXVAL(MM).GT.XXMAX)XXMAX=XXVAL(MM)
      MM=MM+1
  192 GO TO 100
310   CONTINUE
      WRITE(6,320) STAT
320   FORMAT(//,' ABNORMAL FILE END WHILE READING STATION ',4A4)
      STOP
400   WRITE(6,112)
  112 FORMAT(10X,'BEGINNING OF DATA RECORDS NOT CONFIRMED')
C     *****************************************************************
C
C     IF NOT PLOTTING SET HI COND CODE TO  BYPASS PLOT POST-PROCESSOR
C
C     *****************************************************************
  330 IF(IPLOT.LE.0)STOP 40
C     *****************************************************************
C
C     PLOTTING IS FINISH  -- NOW CLOSE THE NEUTRAL TEXT
C
C     *****************************************************************
      CALL PPPEND(PLDATA)
  333 STOP
      END
ADY
```

PROGRAM C: SEASONAL NSF - WQI PLOTS FOR MULTIPLE STORET STATIONS

This program will plot water quality indices selectively by specified time periods. The user can specify up to fifty time periods in creating one curve and a maximum of five curves can be plotted on a frame for up to one hundred STORET stations. The graph can be sealed in the x-direction by station number sequence or by station mile point.

The water quality data input to this program is a mass storage file called "WQI Time File" and created by program A. (See system flowchart on figure 1)

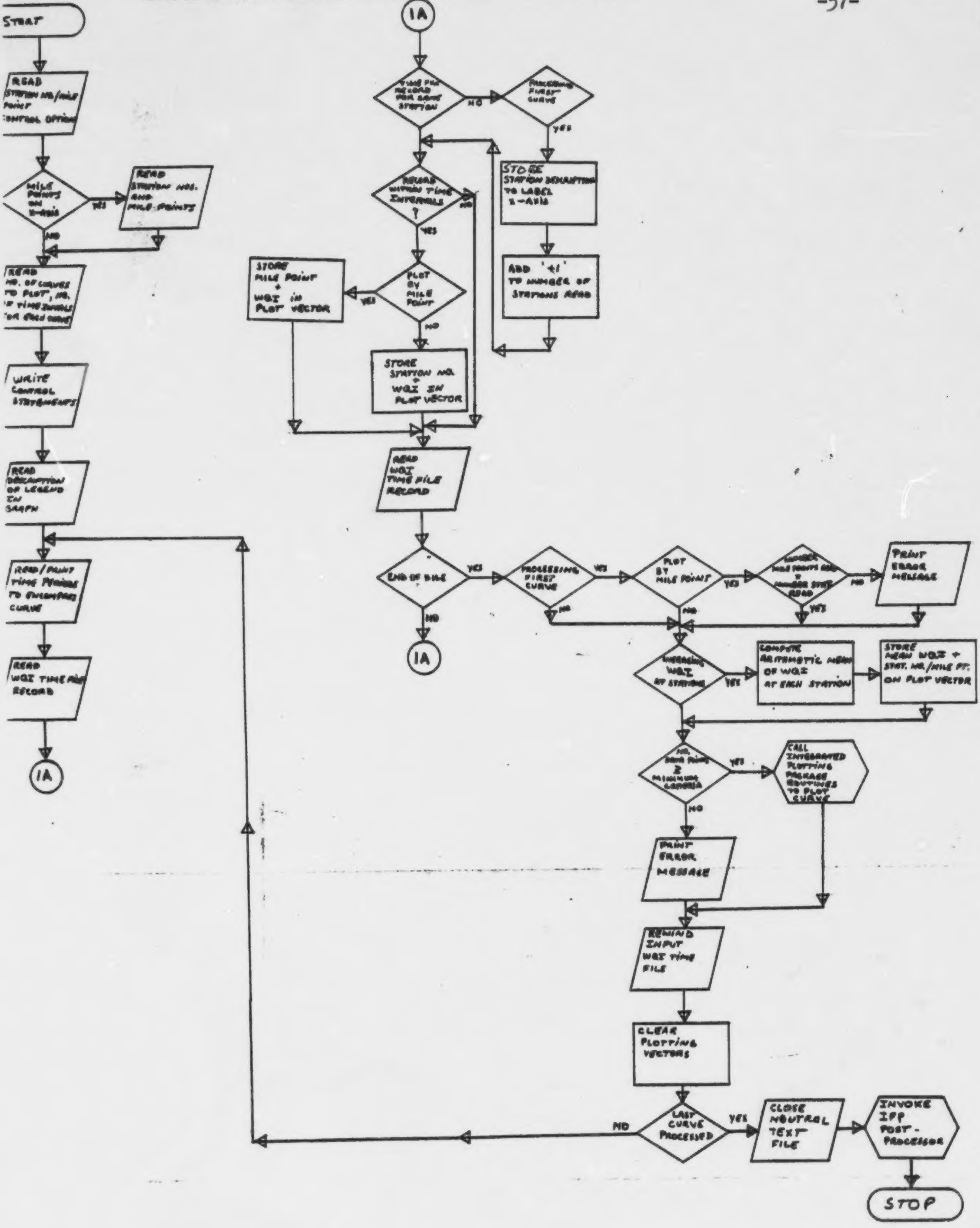
The program first reads control variables, such as the total number of curves to be plotted and the number of dates to be read for each curve, then using these the WQI Time File is read and compared to the specified time periods, those records within these periods are saved in a plotting vector with their corresponding station number or mile point.

Once all records in the WQI Time File are read the program calls Integrated Plotting Routines to draw these points in the graph and to enter the plotting symbol in the graph legend. During the first curve processing the axes are drawn and labelled, including the station name which is printed in the x-axis with the text rotated -90°.

For each of the remaining curves, the WQI Time File is re-read and the appropriate records selected. At the end of file the plotting routines are called to draw the symbol and the curve, and to enter the symbol in the graph legend. The text written in this legend is read in the program by data cards, another input by means of data cards is the station mile points (if this option is chosen).

The user can also specify a minimum number of data points, such that this criteria must be met before plotting takes place. Another option is the plotting of the arithmetic mean of a number of points in a station, for a particular curve rather than the actual data; this option generally yields a smoother curve and is used in the data presented.

SEASONAL NSF-WQI PLOTS FOR MULTIPLE STORET STATIONS - PROGRAM FLOWCHART


START
READ STATION NO./MILE POINT CONTROL OPTION
MILE POINTS ON X-AXIS
YES
READ STATION NOS. AND MILE POINTS
NO
READ NO. OF CURVES TO PLOT, NO. OF TIME INTERVALS FOR EACH CURVE
WRITE CONTROL STATEMENTS
READ DESCRIPTION OF LEGEND IN GRAPH
READ/PRINT TIME PERIODS TO ENCOMPASS CURVE
READ WQI TIME FILE RECORD
1A
1A
TIME FILE RECORD FOR SAME STATION
NO
PROCESSING FIRST CURVE
YES
STORE STATION DESCRIPTION TO LABEL X-AXIS
ADD '+1' TO NUMBER OF STATIONS READ
RECORD WITHIN TIME INTERVALS ?
NO
YES
PLOT BY MILE POINT
YES
STORE MILE POINT + WQI IN PLOT VECTOR
NO
STORE STATION NO. + WQI IN PLOT VECTOR
READ WQI TIME FILE RECORD
END OF FILE
NO
1A
YES
PROCESSING FIRST CURVE
NO
YES
PLOT BY MILE POINT
NO
YES
NUMBER MILE POINTS READ = NUMBER STAT. READ
YES
NO
PRINT ERROR MESSAGE
AVERAGING WQI AT STATIONS
YES
COMPUTE ARITHMETIC MEAN OF WQI AT EACH STATION
STORE MEAN WQI + STAT. NO./MILE PT. ON PLOT VECTOR
NO. DATA POINTS ≥ MINIMUM CRITERIA
YES
CALL INTEGRATED PLOTTING PACKAGE ROUTINES TO PLOT CURVE
NO
PRINT ERROR MESSAGE
REWIND INPUT WQI TIME FILE
CLEAR PLOTTING VECTORS
LAST CURVE PROCESSED
NO
YES
CLOSE NEUTRAL TEXT FILE
INVOKE IPP POST-PROCESSOR
STOP

PROGRAM C - SEASONAL NSF-WQI MULTI-STATION PLOTS

PROGRAM INPUT

1) STATION CONTROL OPTION

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 2	ICNTL	I2	ICNTL = 0, for plots by station sequence ICNTL > 0, for plotting by station mile points
3 - 4	IAVER	I2	IAVER > 0, to average the WQI values at each station for a particular curve IAVER = 0, actual data will be plotted

2) STORET RETRIEVAL MILE POINTS (ICNTL > 0)

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 4	STNO (1)	I4	sequence number for first station (usually 0001)
11 - 20	X (1)	F10.0	mile point location of first station
21 - 24	STNO (2)	I4	sequence number for second station
31 - 40	X (2)	F10.0	mile point location of 2nd station
.	.	.	.
.	.	.	.
.	.	.	.
61 - 64	STNO (4)	I4	sequence number for 4th station
71 - 80	X (4)	F10.0	mile point location of 4th station

NOTE: The sequence number above refers to the actual sequential order of the stations in the graph. This number is used as an index to store the mile points read and to match the data to a similar sequence number in the input mass - storage WQI time file. These sequence numbers do not have to follow any particular order.

The above card is repeated as necessary until all mile points have been read in. A blank field will terminate this type of input.

3) TIME INTERVALS FOR GRAPHICAL DISPLAY

CARD COLUMNS	VARIABLE	FORMAT	DESCRIPTION
1 - 2	NTOTAL	I2	total number of curves to be plotted
4 - 5	MINPTS	I2	minimum number of data points desired by user, (if criteria is not met, plotting for particular curve will not occur)
6 - 10	INVAL (1)	I5	number of date cards to be read for plot of first curve

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
11 - 15	INVAL (2)	I5	number of date cards to be read for second curve
.	.	.	.
.	.	.	.
.	.	.	.
26 - 30	INVAL (5)	I5	number of date cards to be read for 5th curve

NOTE: A maximum of five curves can be plotted, any one curve can specify a maximum of fifty time intervals (dates)

4) DESCRIPTION FOR GRAPH LEGEND

The text entered here will be written next to the symbol being plotted under the graph legend.

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1-48	LEGEND (1,1-12)	12A4	text describing the first curve

The card above is repeated if necessary to enter the description of 'NTOTAL' number of curves.

5) DATE CARDS FOR EACH CURVE

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 6	IBEGIN (1,1-3)	3I2	beginning date (as MONTH-DAY-YEAR) of time period
11 - 16	IEND (1,1-3)	3I2	ending date (as MMDDYY) of time period

In order for the logic of the program to work properly, the change of the year within a season would be written on two separate statements, so that the ending date is a higher numerical value than the beginning date. eg: WINTER 1975 would be entered as:

```
12345678901234567890
111575    123175, followed by:
010176    023076
```

The card above is repeated if necessary for the other time intervals, until the number of intervals specified on variable INVAL (1) for the first curve have been met, followed by the date cards for the second curve specified on variable INVAL (2) ... and repeated for the number of curves desired.

6) NSF-WQI TIME FILE (CREATED IN PROGRAM 1)

RECORD POSITIONS	VARIABLE	FORMAT	DESCRIPTION
1 - 6	IDATE	I6	sample date
7 - 8	IOPTN	I2	IOPTN = 0, CUMM WQI IOPTN > 1, MULT WQI
9 - 24	STAT (1-4)	4A4	STORET primary station number
25 - 27	ISEQ	I3	station sequence number, used to label plots by station number or for matching mile points entered previously
28 - 39	XXVAL	F12.4	date + year digitized - this value is presently not used by this program
40 - 51	WQI	F12.4	NSF-WQI for given date
52 - 99	TOP (1-12)	12A4	station description

SAMPLE DECK SETUP FOR PROGRAM EXECUTION FROM SOURCE STATEMENTS:

```
//EPAIII   JOB ('AAAA')
//STEP1 EXEC IPP906G
//FORT.SYSIN DD *
                    .                                  .
                    .                                  .
                    .                                  .
                       SOURCE DECK GOES HERE
                    .                                  .
                    .                                  .
                    .                                  .
//GO.FT25F001 DD DISP=OLD,DSN=(TIMEFILE NAME FROM WQITIME GOES HERE)
//GO.FT08F001 DD *
0001
05 01     3     1     1     1     1
* = SUMMER 1971 - 1973*
* = SUMMER 1974*
* = SUMMER 1975*
* = SUMMER 1976*
* = SUMMER 1977*
050171    093071
050172    093072
050173    093073
050174    093074
050175    093075
050176    093076
050177    093077
//PLOT.FT07F001 DD SYSOUT=(K,,6129)
```

SAMPLE DECK SETUP FOR PROGRAM EXECUTION FROM A LOAD MODULE:

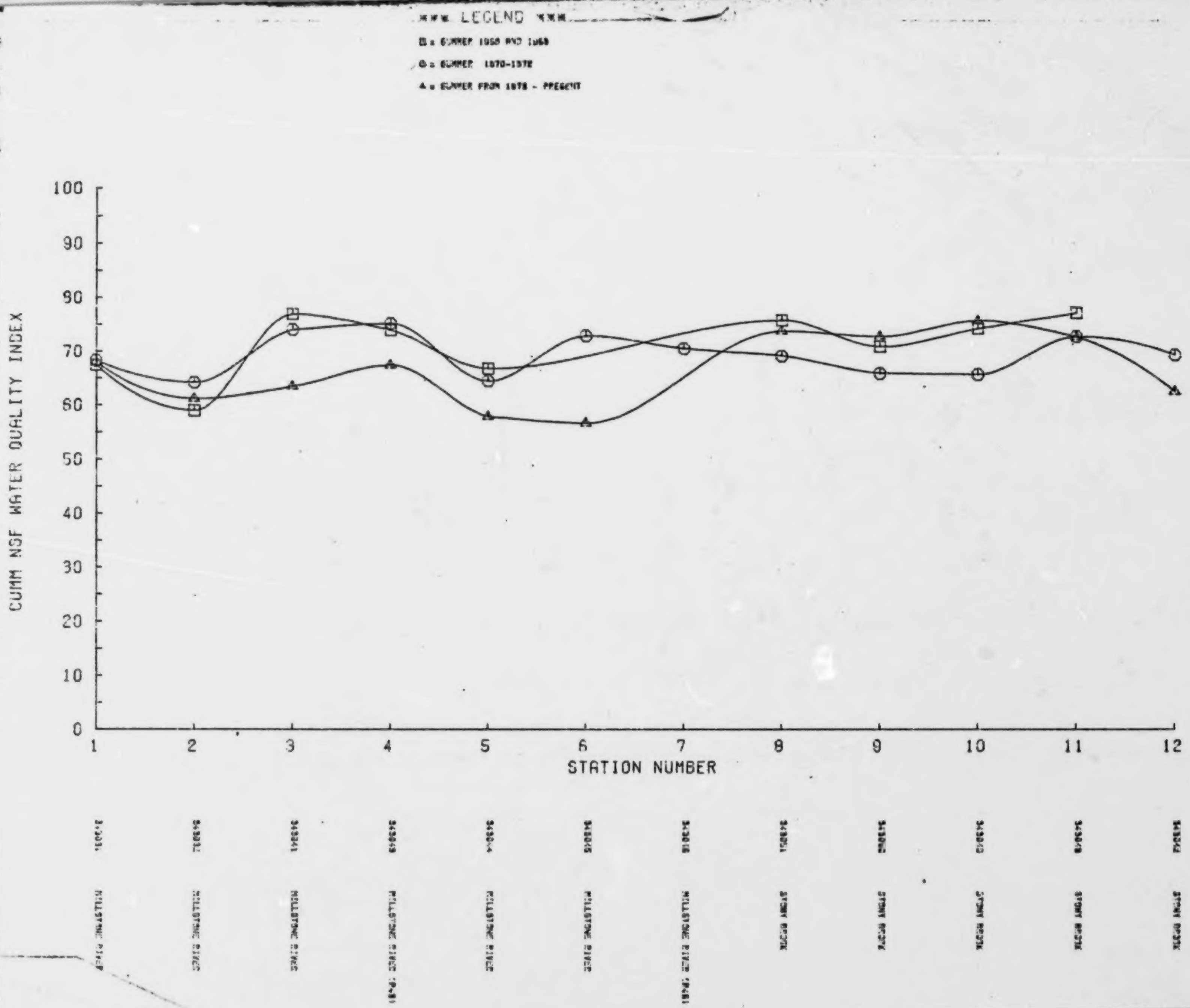
```
//EPAIII   JOB ('AAAA')
//STEP1 EXEC PGM=WQISEASN,REGION=150K
//STEPLIB DD DSN=CN.EPAGAN.R2TW.WQMODL,DISP=SHR
//FT01F001 DD DDNAME=SYSIN,DCB=BLKSIZE=80
//FT06F001 DD SYSOUT=A
//FT07F001 DD SYSOUT=B
//FT16F001 DD SYSOUT=B
//FT15F001 DD SYSOUT=A
//FT02F001 DD DSN=&IPPTAPE,UNIT=SYSDA,SPACE=(CYL,(1,1),RLSE),
// DCB=(RECFM=VSB,LRECL=516,BLKSIZE=3156,DSORG=PS),
// DISP=(NEW,PASS,DELETE)
//FT25F001 DD DISP=OLD,LABEL=(,,,IN),DSN=(TIMEFILE NAME FROM WQITIME GOES HERE)
//FT08F001 DD *
0001
05 01    3    1    1    1    1
* = SUMMER 1971 - 1973*
* = SUMMER 1974*
* = SUMMER 1975*
* = SUMMER 1976*
* = SUMMER 1977*
050171   093071
050172   093072
050173   093073
050174   093074
050175   093075
050176   093076
050177   093077
//STEP2 EXEC PGM=CMP906A,REGION=100K,COND=(8,LE)
//STEPLIB DD DSN=CN.EPACAW.SASS.IPP.LODMOD,DISP=SHR
//FT01F001 DD DDNAME=SYSIN,DCB=BLKSIZE=80
//FT02F001 DD DSN=&IPPTAPE,DISP=(OLD,DELETE,DELETE)
//FT06F001 DD SYSOUT=A
//FT07F001 DD SYSOUT=(K,,6129)
//FT10F001 DD DUMMY
//FT15F001 DD SYSOUT=A
//FT03F001 DD DDNAME=PLOTTAPE
//PLOTTAPE DD SYSOUT=B
```

PROGRAM C: SEASONAL NSF - WQI PLOTS FOR MULTIPLE STORET STATIONS

SAMPLE OUTPUT

```
                                             INPUT CONTROL PARAMETERS
TOTAL NO. OF INTERVAL SETS =  3


*** CURVE NO.  1 ***

NO.  OF TIME INTERVALS FOR THIS SET=   2

FROM            TO
 6/ 1/68        9/30/68
 6/ 1/69        9/30/69

     PLOTTING FOR CURVE NO.  1 -- PROCESSED SUCCESSFULLY WITH  21 POINTS


*** CURVE NO.  2 ***

NO.  OF TIME INTERVALS FOR THIS SET=   3

FROM            TO
 6/ 1/70        9/31/70
 6/ 1/71        9/31/71
 6/ 1/72        9/31/72

     PLOTTING FOR CURVE NO.  2 -- PROCESSED SUCCESSFULLY WITH  35 POINTS


*** CURVE NO.  3 ***

NO.  OF TIME INTERVALS FOR THIS SET=   3

FROM            TO
 6/ 1/73        9/31/73
 6/ 1/74        9/31/74
 6/ 1/75        9/31/75

     PLOTTING FOR CURVE NO.  3 -- PROCESSED SUCCESSFULLY WITH  18 POINTS
```

```
C A L C O M P   P O S T P R O C E S S O R  OF IPP    - COMMENTS AND ERROR MESSAGES -     VERSION 01 MAY 74

FRAME NUMBER     1 STARTING WITH RECORD NUMBER       1
FRAME NUMBER     1 PROCESSED WITH     0 ERRORS DETECTED

SUMMARY
          RECORDS    84
          FRAMES      1
          ERRORS      0

END OF POSTPROCESSOR RUN FOR IPP
```



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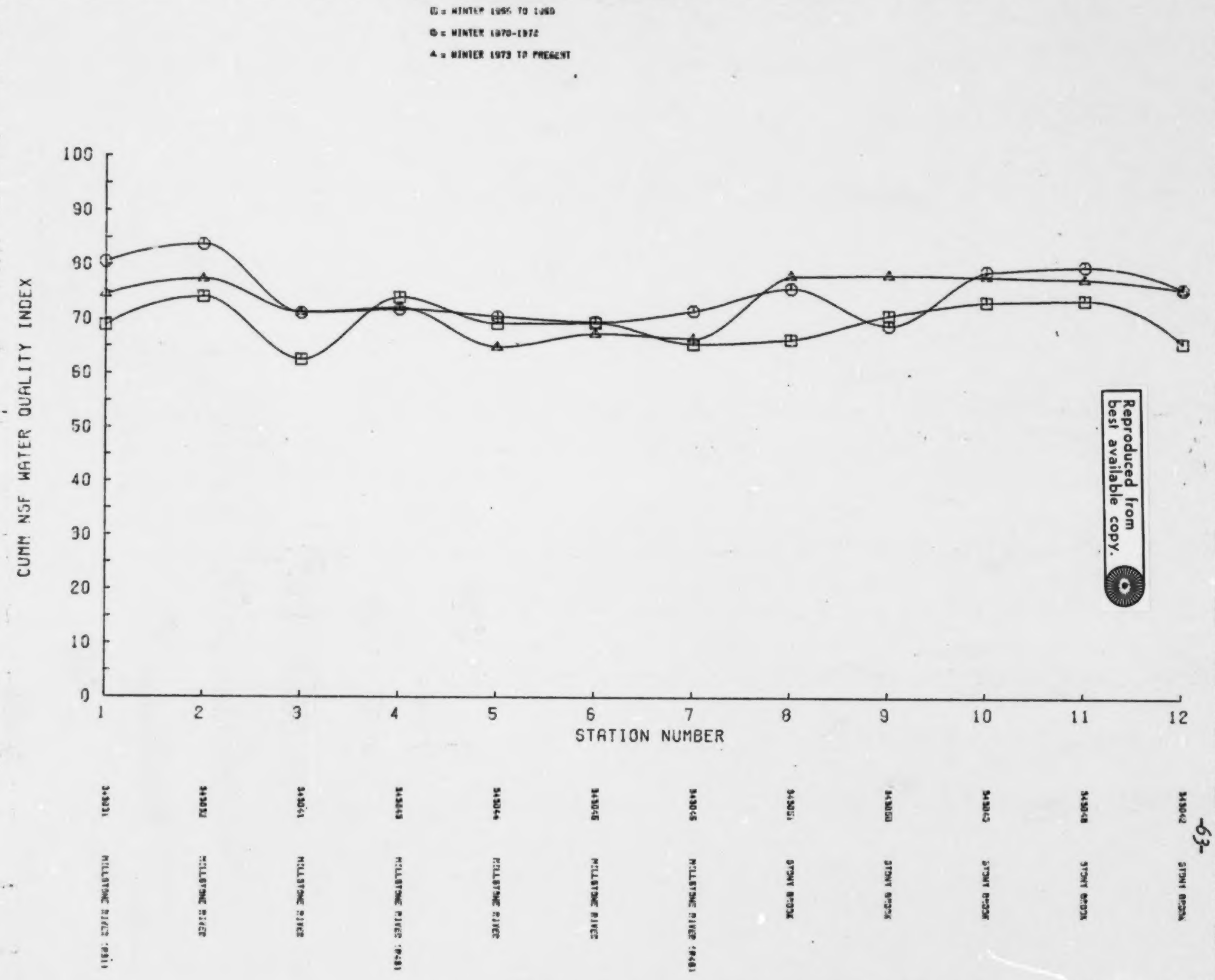
```
                                                  INPUT CONTROL PARAMETERS
TOTAL NO. OF INTERVAL SETS =  3


*** CURVE NO.  1 ***

NO.  OF TIME INTERVALS FOR THIS SET=   8

FROM         TO
11/ 1/66    12/31/66
 1/ 1/67     2/30/67
11/ 1/67    12/31/67
 1/ 1/68     2/30/68
11/ 1/68    12/31/68
 1/ 1/69     2/30/69
11/ 1/69    12/31/69
 1/ 1/70     2/30/70

    PLOTTING FOR CURVE NO.  1 -- PROCESSED SUCCESSFULLY WITH  34 POINTS


*** CURVE NO.  2 ***

NO.  OF TIME INTERVALS FOR THIS SET=   6

FROM         TO
11/ 1/70    12/31/70
 1/ 1/71     2/30/71
11/ 1/71    12/31/71
 1/ 1/72     2/30/72
11/ 1/72    12/31/72
 1/ 1/73     2/30/73

    PLOTTING FOR CURVE NO.  2 -- PROCESSED SUCCESSFULLY WITH  36 POINTS


*** CURVE NO.  3 ***

NO.  OF TIME INTERVALS FOR THIS SET=   6

FROM         TO
11/ 1/73    12/31/73
 1/ 1/74     2/30/74
11/ 1/74    12/31/74
 1/ 1/75     2/30/75
11/ 1/75    12/31/75
 1/ 1/76     2/30/76

    PLOTTING FOR CURVE NO.  3 -- PROCESSED SUCCESSFULLY WITH  17 POINTS
```

```
C A L C O M P   P O S T P R O C E S S O R   OF IPP    - COMMENTS AND ERROR MESSAGES -     VERSION 01 MAY 74

FRAME NUMBER     1 STARTING WITH RECORD NUMBER       1
FRAME NUMBER     1 PROCESSED WITH     0 ERRORS DETECTED

SUMMARY
          RECORDS    67
          FRAMES      1
          ERRORS      0

END OF POSTPROCESSOR RUN FOR IPP
```



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PROGRAM C - SOURCE LISTING

```
C     ****************************************************************** SWQI004
C     ****************************************************************** SWQI005
C                                                                        SWQI006
C     ** THIS PROGRAM WILL SELECT STATIONS ACCORDING TO TIME PERIODS AND SWQI007
C     PLOT THE NSF-WQI OR THE RAW DATA USING OSI IPP PLOTTING PACKAGE ** SWQI008
C                                                                        SWQI009
C     ** USER MAY SPECIFY UP TO 5 TIME INTERVALS --                      SWQI010
C        FOR UP TO 100 STORET STATIONS **                                SWQI011
C                                                                        SWQI012
C     THE GRAPHS CAN BE BY MILE POINT OR BY STATION NUMBERS              SWQI013
C                                                                        SWQI014
C     FILE INPUT IS CREATED BY THE STATION WQI PLOT PROGRAM ..           SWQI015
C     (TIME PLOT) --  THIS FILE IS BY STATION/DATE SEQUENCE              SWQI016
C     ****************************************************************** SWQI017
C                                                                        SWQI018
C     ****************************************************************** SWQI019
C     ****************************************************************** SWQI020
C                                                                        SWQI021
      INTEGER STATNO(100),INVAL(5),SNAMES(100,12),TOP(12),STNO(4)        SWQI022
      DIMENSION X(4),DIST(100),IBEGIN(50,4),IEND(50,4),GIVEN(5),         SWQI023
     1SYMBOL(14),STAT(4),YPOINT(800),XPOINT(800),PLDATA(30),LEGEND(5,12) SWQI024
      DIMENSION BUFX(500),BUFY(500),XAVER(100),YAVER(100)                SWQI025
      DATA SYMBOL/'Q','O','T','+','X','D','A','M','Z','Y','B','*','H','I SWQI026
     1'/                                                                 SWQI027
      IL=1                                                               SWQI028
      M=8                                                                SWQI029
C     ****************************************************************** SWQI030
C                                                                        SWQI031
C     READ STATION CONTROL OPTION  --  MILE POINT OR STATION ID SEQUENCE SWQI032
C                                                                        SWQI033
C     READ ALSO OPTION TO AVERAGE VALUES AT A STATION FOR A PARTICULAR   SWQI034
C     CURVE (IAVER .GT. 1 )  ....                                        SWQI035
C                                                                        SWQI036
C     NOTE  --  ICNTL = 0  FOR PLOTS BY SEQUENCE OF STATION              SWQI037
C               ICNTL = 1 FOR PLOTTING STATION MILE POINTS               SWQI038
C                                                                        SWQI039
C     ****************************************************************** SWQI040
      READ(M,21)ICNTL,IAVER                                              SWQI041
   21 FORMAT(2I2)                                                        SWQI042
      IF(ICNTL.LE.0)GO TO 5                                              SWQI043
    4 READ(M,20)(STNO(K),X(K) , K=1,4)                                   SWQI044
   20 FORMAT(4(I4,6X,F10.0))                                             SWQI045
      DO 3 J=1,4                                                         SWQI046
C     ****************************************************************** SWQI047
C                                                                        SWQI048
C     NOTE ... BLANK FIELD WILL INTERRUPT INPUT  ...                     SWQI049
C                                                                        SWQI050
C     ****************************************************************** SWQI051
      IF(STNO(J).EQ.0)GO TO 5                                            SWQI052
      STATNO(IL)=STNO(J)                                                 SWQI053
C     ****************************************************************** SWQI054
C                                                                        SWQI055
C     MILE POINT IS SAVED USING STAT. NO. AS INDEX ...                   SWQI056
C                                                                        SWQI057
```

PROGRAM C - SOURCE LISTING

```
C     ****************************************************************** SWQI058
      ILOC =STNO(J)                                                      SWQI059
      DIST(ILOC)=X(J)                                                    SWQI060
      IL=IL+1                                                            SWQI061
    3 CONTINUE                                                           SWQI062
      GO TO 4                                                            SWQI063
C     ****************************************************************** SWQI064
C                                                                        SWQI065
C     VARIABLE IL WILL CONTAIN ACTUAL NO. OF MILE PTS.FOR STATIONS READ  SWQI066
C                                                                        SWQI067
C     ****************************************************************** SWQI068
    5 IL=IL-1                                                            SWQI069
C     ****************************************************************** SWQI070
C                                                                        SWQI071
C     READ TIME INTERVALS (MMDDYY) DESIRED FOR PLOTTING  ...             SWQI072
C                                                                        SWQI073
C     ****************************************************************** SWQI074
      READ(M,26)NTOTAL,MINPTS,(INVAL(J),J=1,5)                           SWQI075
   26 FORMAT(I2,1X,I2,5I5)                                               SWQI076
C     ****************************************************************** SWQI077
C                                                                        SWQI078
C              TO PRODUCE ONE CURVE ...                                  SWQI079
C     NOTE ... INVAL(I)= NO. OF DATES TO BE READ AT EACH INTERVAL        SWQI080
C              NTOTAL= TOTAL NUMBER OF CURVES TO BE PLOTTED              SWQI081
C                                                                        SWQI082
C     ****************************************************************** SWQI083
      WRITE(6,23)NTOTAL                                                  SWQI084
   23 FORMAT('1',///,50X,'INPUT CONTROL PARAMETERS',/,5X,                SWQI085
     1'TOTAL NO. OF INTERVAL SETS =' ,I3,/)                              SWQI086
C     ****************************************************************** SWQI087
C                                                                        SWQI088
C     PRINT STATION NUMBERS AND MILE POINTS ...                          SWQI089
C                                                                        SWQI090
C     ****************************************************************** SWQI091
      IF(ICNTL.LE.0) GO TO 11                                            SWQI092
      WRITE(6,8)                                                         SWQI093
    8 FORMAT(//,5X,'STATION NUMBER',5X,'MILE POINT')                     SWQI094
      WRITE(6,16)(STATNO(J),DIST(J),J=1,IL)                              SWQI095
   16 FORMAT(9X,I6,10X,F6.1)                                             SWQI096
C     ****************************************************************** SWQI097
C                                                                        SWQI098
C     READ TEXT FOR LEGEND IN CHARACTER BALANCED NOTATION ...            SWQI099
C                                                                        SWQI100
C     ****************************************************************** SWQI101
   11 READ(M,2)((LEGEND(J,K),K=1,12),J=1,NTOTAL)                         SWQI102
    2 FORMAT(12A4)                                                       SWQI103
      DO 99  KL=1,NTOTAL                                                 SWQI104
      INDEX=1                                                            SWQI105
      ICNT=0                                                             SWQI106
      IOLD=0                                                             SWQI107
      LAST=INVAL(KL)                                                     SWQI108
      DO 6  J=1,LAST                                                     SWQI109
      READ(M,22)((IBEGIN(J,K),K=1,3),(IEND(J,K),K=1,3))                  SWQI110
   22 FORMAT(3I2,4X,3I2)                                                 SWQI111
```

PROGRAM C - SOURCE LISTING

```
    6 CONTINUE                                                          SWQI112
C     ****************************************************************** SWQI113
C                                                                       SWQI114
C     WRITE INPUT PARAMETERS                                            SWQI115
C                                                                       SWQI116
C     ****************************************************************** SWQI117
      WRITE(6,33)KL,INVAL(KL)                                           SWQI118
   33 FORMAT(//,5X,'*** CURVE NO. ',I2,' ***',//,5X,                     SWQI119
     1'NO.  OF TIME INTERVALS FOR THIS SET= ',I3,//,5X,'FROM',10X,'TO') SWQI120
      WRITE(6,24) ((IBEGIN(J,K),K=1,3),(IEND(J,K),K=1,3),J=1,LAST)      SWQI121
   24 FORMAT(2(5X,I2,'/',I2,'/',I2))                                    SWQI122
      READ(25,25)IDATE,IOPTN,STAT,ISEQ,XXVAL,WQI,TOP                    SWQI123
   25 FORMAT(I6,I2,4A4,I3,2F12.4,12A4)                                  SWQI124
C     ****************************************************************** SWQI125
C                                                                       SWQI126
C     SAVE FIRST STATION NUMBER -- NEEDED FOR PLOT CONTROL              SWQI127
C                                                                       SWQI128
C     ****************************************************************** SWQI129
      IS1=ISEQ                                                          SWQI130
      GO TO 1                                                           SWQI131
C     ****************************************************************** SWQI132
C                                                                       SWQI133
C     READ STATION RECORD ... IF LAST RECORD GO TO PLOT ROUTINE         SWQI134
C                                                                       SWQI135
C     ****************************************************************** SWQI136
   18 READ(25,25,END=30)IDATE,IOPTN,STAT,ISEQ,XXVAL,WQI,TOP             SWQI137
    1 IF(ISEQ.EQ.IOLD.OR.KL.GT.1)GO TO 19                               SWQI138
C     ****************************************************************** SWQI139
C                                                                       SWQI140
C     SAVE STATION DESCRIPTION TO LABEL THE X-AXIS                      SWQI141
C                                                                       SWQI142
C     ****************************************************************** SWQI143
      DO 29  J=1,12                                                     SWQI144
      SNAMES(ISEQ,J)=TOP(J)                                             SWQI145
   29 CONTINUE                                                          SWQI146
C     ****************************************************************** SWQI147
C                                                                       SWQI148
C     COUNT NUMBER OF STATIONS READ ... FOR TEST VS. NO. OF MILE PTS. RE SWQI149
C                                                                       SWQI150
C     ****************************************************************** SWQI151
      ICNT=ICNT+1                                                       SWQI152
      IOLD=ISEQ                                                         SWQI153
   19 DO 10  J=1,LAST                                                   SWQI154
C     ****************************************************************** SWQI155
C                                                                       SWQI156
C     SET BEGINNING DAY TO 1 ...  LAST DAY TO 31 IF BLANK               SWQI157
C                                                                       SWQI158
C     ****************************************************************** SWQI159
      IF(IBEGIN(J,2).LE.0)IBEGIN(J,2)=1                                 SWQI160
      IF(IEND(J,2).LE.0)IEND(J,2)=31                                    SWQI161
C     ****************************************************************** SWQI162
C                                                                       SWQI163
C     MERGE BEGINNING AND ENDING DATES TO ONE FIELD  ... ALSO ..        SWQI164
C     CHANGE DATE AS MMDDYY TO YYMMDD ...                               SWQI165
```

PROGRAM C - SOURCE LISTING

```
C                                                                       SWQI166
C     ****************************************************************** SWQI167
      IBEGIN(J,4)=IBEGIN(J,3)*10000+IBEGIN(J,1)*100+IBEGIN(J,2)         SWQI168
      IEND(J,4)=IEND(J,3)*10000+IEND(J,1)*100+IEND(J,2)                 SWQI169
   10 CONTINUE                                                          SWQI170
C     ****************************************************************** SWQI171
C                                                                       SWQI172
C     SELECT THE DATA TO BE PLOTTED  --- USING THE TIME INTERVALS ...   SWQI173
C                                                                       SWQI174
C     ****************************************************************** SWQI175
      DO 9  J=1,LAST                                                    SWQI176
      IF(IDATE.GE.IBEGIN(J,4).AND.IDATE.LE.IEND(J,4))GO TO 27           SWQI177
    9 CONTINUE                                                          SWQI178
C                                                                       SWQI179
C     NO DATA WITHIN DESIRED TIME PERIODS -- READ NEXT RECORD ...       SWQI180
C                                                                       SWQI181
      GO TO 18                                                          SWQI182
C     ****************************************************************** SWQI183
C     TEST IF PLOT BY MILE PT. OR BY STATION  ...                       SWQI184
C     ****************************************************************** SWQI185
   27 IF(ICNTL.LE.0)GO TO 28                                            SWQI186
      XPOINT(INDEX)=DIST(ISEQ)                                          SWQI187
      YPOINT(INDEX)=WQI                                                 SWQI188
      INDEX=INDEX+1                                                     SWQI189
      GO TO 18                                                          SWQI190
   28 XPOINT(INDEX)=ISEQ                                                SWQI191
      YPOINT(INDEX)=WQI                                                 SWQI192
      INDEX=INDEX+1                                                     SWQI193
      GO TO 18                                                          SWQI194
C     ****************************************************************** SWQI195
C                                                                       SWQI196
C     COMPARE MILE POINTS READ VS STATIONS READ ON FIRST PASS ...       SWQI197
C                                                                       SWQI198
C     ****************************************************************** SWQI199
   30 IF(KL.EQ.1.AND.ICNTL.GT.0.AND.ICNT.NE.IL)WRITE(6,31)IL,ICNT       SWQI200
   31 FORMAT(///,10X,'WARNING ***  ',5X,I3,'  MILE POINTS READ    DO NOT SWQI201
     1 MATCH ',I3,'  STATIONS READ')                                    SWQI202
C     ****************************************************************** SWQI203
C                                                                       SWQI204
C     IF DESIRED .. AVERAGE WQI AT SAME STATION FOR A SMOOTH CURVE ...  SWQI205
C                                                                       SWQI206
C     ****************************************************************** SWQI207
      IF(IAVER.LE.0)GO TO 17                                            SWQI208
      INDEX2=1                                                          SWQI209
      IHI=INDEX-1                                                       SWQI210
      XPOINT(INDEX)=-358.                                               SWQI211
      SUM=0.0                                                           SWQI212
      INUM=0                                                            SWQI213
      DO 12  J=1,IHI                                                    SWQI214
   13 SUM = SUM + YPOINT(J)                                             SWQI215
      INUM=INUM + 1                                                     SWQI216
      IF(XPOINT(J+1).EQ.XPOINT(J)) GO TO 12                             SWQI217
C     ****************************************************************** SWQI218
C                                                                       SWQI219
```

PROGRAM C - SOURCE LISTING

```
C     NEW STATION  ... AVERAGE VALUES FOR PREVIOUS STAT....             SWQI220
C                                                                       SWQI221
C     ***************************************************************** SWQI222
      YAVER(INDEX2)=SUM/FLOAT(INUM)                                     SWQI223
      XAVER(INDEX2)=XPOINT(J)                                           SWQI224
      INDEX2=INDEX2+1                                                   SWQI225
      SUM=0.0                                                           SWQI226
      INUM=0                                                            SWQI227
   12 CONTINUE                                                          SWQI228
C     ***************************************************************** SWQI229
C                                                                       SWQI230
C     *** COMMANDS BELOW USE THE INTEGRATED PLOTTING PACKAGE ***        SWQI231
C                                                                       SWQI232
C     ***************************************************************** SWQI233
C                                                                       SWQI234
C     TEST IF NO. OF DATA POINTS MEET THE MINIMUM REQUIRED NUMBER       SWQI235
C                                                                       SWQI236
   17 IF(INDEX-1.GE.MINPTS)GO TO 7                                      SWQI237
      WRITE(6,34)INDEX,MINVAL,KL                                        SWQI238
   34 FORMAT(///,5X,'** NOTE **',5X,I3,' DATA POINTS DO NOT MEET THE',  SWQI239
     1' MINIMUM ',I3,' POINTS -- PLOTTING OF CURVE',I3,' WILL BE BYPASSE SWQI240
     2D')                                                               SWQI241
      GO TO 92                                                          SWQI242
C     ***************************************************************** SWQI243
C                                                                       SWQI244
C     INITIAL SET-UP IS DONE DURING FIRST CURVE PROCESSING              SWQI245
C                                                                       SWQI246
C     ***************************************************************** SWQI247
    7 IF(KL.GT.1)GO TO 45                                               SWQI248
C                                                                       SWQI249
C     SET FRAME FOR 36 INCH PLOTTER ...                                 SWQI250
C                   12                                                  SWQI251
      CALL CMLBF('PLEASE RUN ON 1136 PLOTTER')                          SWQI252
C                               1039                                    SWQI253
C     SET INITIAL VALUES ON SPECIFICATIONS ARRAY                        SWQI254
C                                                                       SWQI255
      CALL SSPECS(PLDATA)                                               SWQI256
C                                                                       SWQI257
C     RESET SIZE OF AXES (INCHES)                                       SWQI258
C                                                                       SWQI259
      XSCALE=10.0                                                       SWQI260
      YSCALE=5.0                                                        SWQI261
      PLDATA(7)=XSCALE                                                  SWQI262
      PLDATA(8)=YSCALE                                                  SWQI263
C                         3.5                                           SWQI264
C     MOVE X-AXIS 5.5 INCHES AWAY FROM ORIGIN                           SWQI265
C                                                                       SWQI266
      PLDATA(2)=5.5 →3.5                                                SWQI267
      IF(ICNT.LT.ISEQ)ICNT=ISEQ                                         SWQI268
C     ***************************************************************** SWQI269
C                                                                       SWQI270
C     SET RANGE OF VALUES ON X-AXIS ** FOR MILE POINTS OR STATION NOS.  SWQI271
C                                                                       SWQI272
C     ***************************************************************** SWQI273
```

```
      IF(ICNTL.GT.0)GO TO 35                                             SWQI274
      PLDATA(3)=IS1+ICNT-1                                               SWQI275
      PLDATA(4)=IS1                                                      SWQI276
      PLDATA(9)=ICNT-1                                                   SWQI277
C                                                                        SWQI278
C     ANNOTATIONS WILL HAVE NO DECIMALS                                  SWQI279
C                                                                        SWQI280
      PLDATA(28)=0.0                                                     SWQI281
      GO TO 36                                                           SWQI282
C     ****************************************************************** SWQI283
C                                                                        SWQI284
C     CHOOSE SCALE NUMBERS FOR MILE POINTS ...                           SWQI285
C                                                                        SWQI286
C     ****************************************************************** SWQI287
   35 GIVEN(1)=DIST(IL)                                                  SWQI288
      GIVEN(2)=DIST(1)                                                   SWQI289
      GIVEN(3)=IL - 1                                                    SWQI290
      CALL FABLIX(GIVEN,PLDATA)                                          SWQI291
C                                                                        SWQI292
C     ALLOW ONE DECIMAL IN MILE POINTS                                   SWQI293
C                                                                        SWQI294
      PLDATA(28)=1.0                                                     SWQI295
C     ****************************************************************** SWQI296
C                                                                        SWQI297
C     SET RANGE OF VALUES ON Y-AXIS                                      SWQI298
C                                                                        SWQI299
C     ****************************************************************** SWQI300
   36 PLDATA(5)=100.                                                     SWQI301
      PLDATA(6)=0.0                                                      SWQI302
C     CHANGE DEFAULT VALUE OF DIVISIONS FOR Y-AXIS                       SWQI304
C                                                                        SWQI307
C     DRAW ANNOTATION NUMBERS AT THE BOTTOM SCALE MARKS                  SWQI308
C                                                                        SWQI309
      CALL NODLIB(PLDATA)                                                SWQI310
C                                                                        SWQI311
C     DRAW ANNOTATION NUMBER AT THE LEFT SCALE MARKS                     SWQI312
C                                                                        SWQI313
      CALL NODLIL(PLDATA)                                                SWQI314
C     ****************************************************************** SWQI315
C                                                                        SWQI316
C     DRAW  X-Y AXES - WITH TWICE AS MANY TICKS AS  ANNOTATIONS IN Y-AXI SWQI317
C                                                                        SWQI318
C     ****************************************************************** SWQI319
      PLDATA(10)=PLDATA(10)*2.0                                          SWQI320
      CALL AXLILI(PLDATA)                                                SWQI321
C                                                                        SWQI322
CC    CLEAR ZONES VARIABLES --  SINCE UPDATED BY ABOVE SUBROUTINE        SWQI323
C                                                                        SWQI324
      CALL ZZONES(PLDATA)                                                SWQI325
C     ****************************************************************** SWQI326
C                                                                        SWQI327
C     WRITE LEGEND IDENTIFICATION ...                                    SWQI328
C                                                                        SWQI329
C     ****************************************************************** SWQI330
```

PROGRAM C - SOURCE LISTING

```
      PLDATA(22)=5.0
      PLDATA(23)=12.0 --> 9.6
      CALL GTITLE('/*** LEGEND ***/',PLDATA)
C
C     SET PLOTTING SYMBOL DESIRED
C
   45 PLDATA(16)=SYMBOL(KL)
      IF(IAVER.GT.0)GO TO 14
C
C     ENTER NUMBER OF DATA POINTS TO PLOT
C
      PLDATA(13)=INDEX-1
C     PLOT SYMBOL AT DATA POINT LOCATIONS
      CALL PSLILI(XPOINT,YPOINT,PLDATA)
C     ******************************************************************
C
C     NOW CONNECT DATA POINTS WITH PARABOLAS TO FIT THE DATA ...
C
C     ******************************************************************
      CALL PFLILI(XPOINT,YPOINT,BUFX,BUFY,PLDATA)
      GO TO 15
C
C     ENTER NUMBER OF DATA POINTS TO PLOT
C
   14 PLDATA(13)=INDEX2-1
C
C     PLOT SYMBOL AT DATA POINT LOCATIONS
C
      CALL PSLILI(XAVER,YAVER,PLDATA)
C     ******************************************************************
C
C     NOW CONNECT DATA POINTS WITH PARABOLAS TO FIT THE DATA ...
C
C     ******************************************************************
      CALL PFLILI(XAVER,YAVER,BUFX,BUFY,PLDATA)
C     ******************************************************************
C
C     WRITE TEXT IN GRAPH LEGEND FOR THIS CURVE ...
C
C     ******************************************************************
   15 DO 48  J=1,12
      TOP(J)=LEGEND(KL,J)
   48 CONTINUE
C
C     REDUCE SIZE OF TEXT BY HALF ...
C
      PLDATA(17)=PLDATA(17)/2.0
      PLDATA(18)=PLDATA(18)/2.0
C
C     SET INITIAL POSITION OF LEGEND TEXT
C
      PLDATA(22)=5.0
      PLDATA(23)=11.8 - (.2*(KL-1))
C
                 ↘ 9.4
```

```
C     WRITE LEGEND TWICE SO ITS LEGIBLE ...                             SWQI385
C                                                                       SWQI386
      DO 47  LL=1,2                                                     SWQI387
      CALL SYMKEY(TOP,PLDATA)                                           SWQI388
   47 CONTINUE                                                          SWQI389
C                                                                       SWQI390
C     RESTORE SIZE OF TEXT ...                                          SWQI391
C                                                                       SWQI392
      PLDATA(17)=PLDATA(17)*2.0                                         SWQI393
      PLDATA(18)=PLDATA(18)*2.0                                         SWQI394
C     ***************************************************************** SWQI395
C                                                                       SWQI396
C     LABELLING OF GRAPH -- ONLY ON PROCESSING OF FIRST CURVE ...       SWQI397
C                                                                       SWQI398
C     ***************************************************************** SWQI399
      IF(KL.GT.1)GO TO 91                                               SWQI400
C                                                                       SWQI401
C     CHANGE DEFAULT SPACING OF TITLES TO THE AXES                      SWQI402
C                                                                       SWQI403
      PLDATA(24)=.20                                                    SWQI404
      PLDATA(26)=.60                                                    SWQI405
      IF(ICNTL.GT.0)GO TO 37                                            SWQI406
      CALL TITLEB('+  STATION NUMBER+',PLDATA)                          SWQI407
      GO TO 38                                                          SWQI408
   37 CALL TITLEB('+  STATION MILE POINT+',PLDATA)                      SWQI409
   38 IF(IOPTN.EQ.0)CALL TITLEL('+CUMM NSF WATER QUALITY INDEX+',PLDATA) SWQI410
      IF(IOPTN.NE.0)CALL TITLEL('+MULT NSF WATER QUALITY INDEX+',PLDATA) SWQI411
C                                                                       SWQI412
C     PRINT GRAPH DESCRIPTION AT X-AXIS ROTATING TEXT 270 DEGREES       SWQI413
C                                                                       SWQI414
      PLDATA(20)=-90.0                                                  SWQI415
C                                                                       SWQI416
C     REDUCE SIZE OF LETTERS BY HALF ...                                SWQI417
C                                                                       SWQI418
      PLDATA(17)=PLDATA(17)/2.                                          SWQI419
      PLDATA(18)=PLDATA(18)/2.                                          SWQI420
C                                                                       SWQI421
C     SET DISTANCE FROM FRAME ORIGIN FOR STAT. DESCRIPTION              SWQI422
C                                                                       SWQI423
      PLDATA(23)=4.8 →2.8                                               SWQI424
C     ***************************************************************** SWQI425
C                                                                       SWQI426
C     COMPUTE INCREMENT BETWEEN STATIONS IN X-AXIS ... THEN USE THIS    SWQI427
C     INCREMENT TO PLOT STATION NAME AT MILE PT. OR STATION NO. ...     SWQI428
C                                                                       SWQI429
C     ***************************************************************** SWQI430
      IF(ICNTL.LE.0)FACTOR=XSCALE/(ICNT- 1)                             SWQI431
      IF(ICNTL.GT.0)FACTOR=XSCALE/(PLDATA(3)-PLDATA(4))                 SWQI432
      DO 40 J=1,ICNT                                                    SWQI433
      IF(ICNTL.LE.0) GO TO 41                                           SWQI434
      PLDATA(22)=FACTOR*DIST(J)+PLDATA(1)-FACTOR*PLDATA(4)              SWQI435
      GO TO 42                                                          SWQI436
   41 PLDATA(22)=FACTOR*(IS1+(J-2) ) + PLDATA(1)                        SWQI437
   42 DO 44  JJ=1,12                                                    SWQI438
```

PROGRAM C - SOURCE LISTING

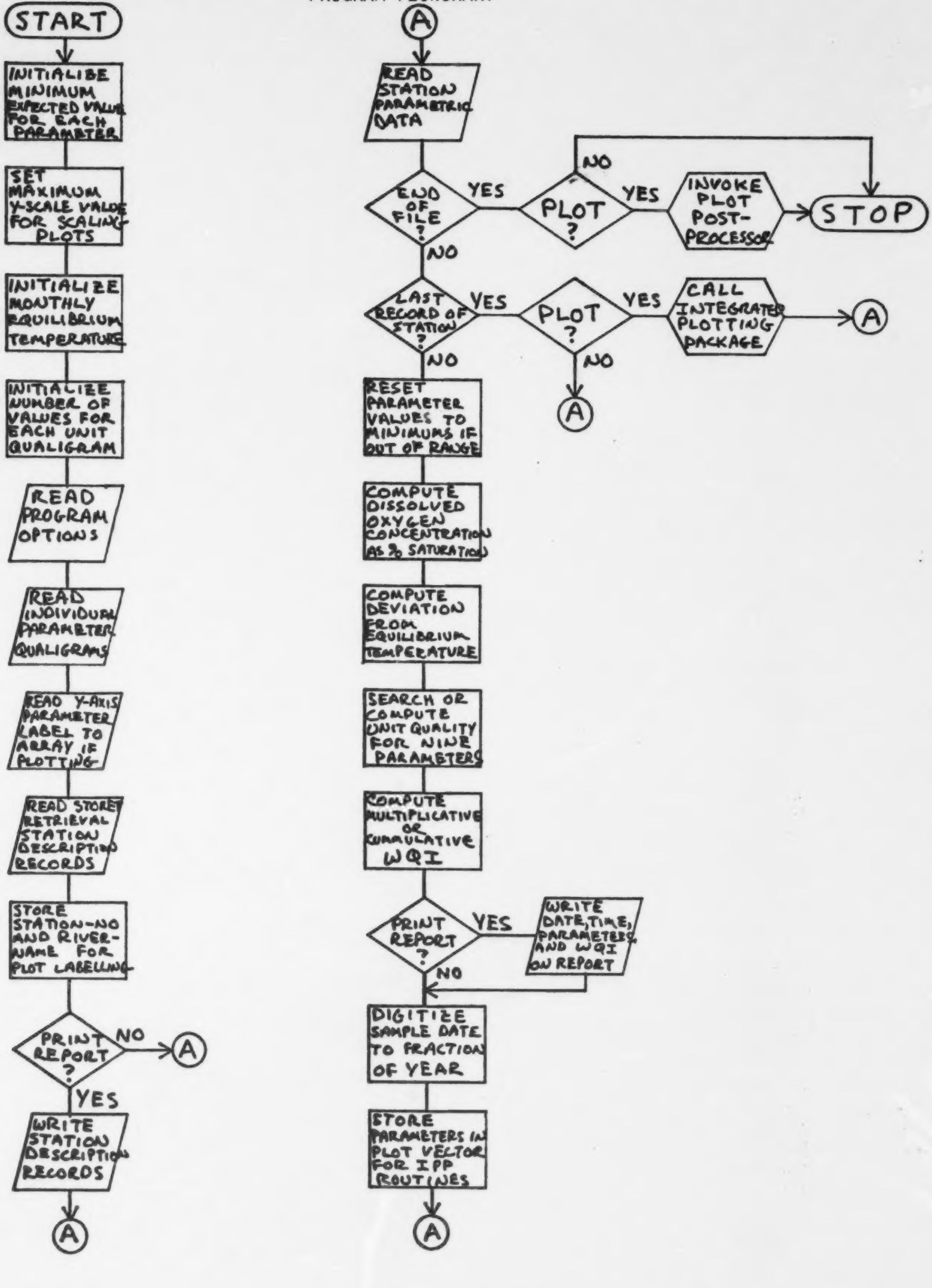
```
      TOP(JJ)=SNAMES(J,JJ)
   44 CONTINUE
      CALL GTITLE(TOP,PLDATA)
   40 CONTINUE
C
C     RESTORE SIZE OF TEXT ...
C
      PLDATA(17)=PLDATA(17)*2.
      PLDATA(18)=PLDATA(18)*2.
C
C     RESTORE ANGLE OF TEXT TO HORIZONTAL POSITION ...
C
      PLDATA(20)=0.0
C     ******************************************************************
C
C     RE-INITIALIZE STATION FILE, CLEAR DATA ARRAYS ...
C
C     ******************************************************************
   91 INDEX=INDEX-1
      WRITE(6,46)KL,INDEX
   46 FORMAT(/,9X,'PLOTTING FOR CURVE NO.',I3,' -- PROCESSED SUCCESSFULL
     1Y WITH',I4,' POINTS')
   92 REWIND 25
      DO 39 J=1,INDEX
      XPOINT(J)=0.0
      YPOINT(J)=0.0
   39 CONTINUE
   99 CONTINUE
C     ******************************************************************
C
C     CLOSE NEUTRAL TEXT ...
C
C     ******************************************************************
      CALL PPPEND(PLDATA)
      STOP
      END
/*
```

PROGRAM D: PLOT/PRINT NSF-WQI TIME PROFILE AND NSF-WQI PARAMETER DATA

This program is a combination of programs A and B. The report is similar to the report from program B. The only change is the addition of the Cummulative or Multiplicative WQI on the right side of the report.

The plot is similar to the plot in program B. The program plots the first five parameters on the first frame. It then plots the next four parameters and the Cummulative or Multiplicative WQI (as computed in program A) on the next frame. As presently written, each frame is 8½ x 11 inches and due to the high resolution required, it can only be satisfactorily produced on the calcomp plotter.

PLOT/PRINT NSF-WQI PARAMETER DATA AND INDEX PROGRAM FLOWCHART


START
INITIALIBE MINIMUM EXPECTED VALUE FOR EACH PARAMETER
SET MAXIMUM Y-SCALE VALUE FOR SCALING PLOTS
INITIALIZE MONTHLY EQUILIBRIUM TEMPERATURE
INITIALIZE NUMBER OF VALUES FOR EACH UNIT QUALIGRAM
READ PROGRAM OPTIONS
READ INDIVIDUAL PARAMETER QUALIGRAMS
READ Y-AXIS PARAMETER LABEL TO ARRAY IF PLOTTING
READ STORET RETRIEVAL STATION DESCRIPTION RECORDS
STORE STATION-NO AND RIVER-NAME FOR PLOT LABELLING
PRINT REPORT ?
NO
A
YES
WRITE STATION DESCRIPTION RECORDS
A
A
READ STATION PARAMETRIC DATA
END OF FILE ?
YES
PLOT ?
NO
YES
INVOKE PLOT POST-PROCESSOR
STOP
NO
LAST RECORD OF STATION ?
YES
PLOT ?
YES
CALL INTEGRATED PLOTTING PACKAGE
A
NO
A
NO
RESET PARAMETER VALUES TO MINIMUMS IF OUT OF RANGE
COMPUTE DISSOLVED OXYGEN CONCENTRATION AS % SATURATION
COMPUTE DEVIATION FROM EQUILIBRIUM TEMPERATURE
SEARCH OR COMPUTE UNIT QUALITY FOR NINE PARAMETERS
COMPUTE MULTIPLICATIVE OR CUMMULATIVE WQI
PRINT REPORT ?
YES
WRITE DATE, TIME, PARAMETERS, AND WQI ON REPORT
NO
DIGITIZE SAMPLE DATE TO FRACTION OF YEAR
STORE PARAMETERS IN PLOT VECTOR FOR IPP ROUTINES
A

PROGRAM D: PLOT/PRINT NSF-WQI TIME PROFILE AND NSF-WQI PARAMETER DATA

PROGRAM INPUT

1) TO UPDATE PROGRAM WITH EQUILIBRIUM TEMPERATURES:

If necessary, change source statement number 31 to the applicable equilibrium temperatures. Reference number 5 has tables listing these values applicable to most locations in the United States.

2) PROGRAM OPTIONS CARD:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1-2	IPRNT	I2	Set 0, to produce report of WQI parameter data and index.
3-4	IPLOT	I2	Set 0, to plot 5 parameters/ frame of above data.
5-6	OPTION	I2	Set 0, for Mult. WQI Set 0, for Cumm. WQI

3) TO MODIFY DIGITIZED UNIT QUALIGRAMS FOR PARAMETERS:

The data shown on page 78 is for linear approximations to the mean curve of the input qualigrams for each of the nine parameters as shown on appendix A. This data is provided with the program. If the user desires to improve these values, first modify source statement number ___ to the new number values to be read for each parameter, then read these values as follows:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1-10	TABLE (1,1,1)	F10.0	First value of x-scale for 1st parameter.
11-20	TABLE (2,1,1)	F10.0	Second value of x-scale for 1st parameter.
.	.	.	.
.	.	.	.
.	.	.	.
71-80	TABLE (8,1,1)	F10.0	Eighth value of x-scale for 1st parameter.

The card above is repeated until all x-scale values for the 1st parameter unit qualigrams have been read.

The y-values (unit qualities) for the corresponding x-values read above are now entered:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1-10	TABLE (1,2,1)	F10.0	Corresponding 1st value of y-scale for 1st parameter.
11-20	TABLE (2,2,1)	F10.0	Corresponding 2nd value of y-scale for 1st parameter.
.	.	.	.
.	.	.	.
.	.	.	.
71-80	TABLE (8,2,1)	F10.0	Corresponding 8th value of y-scale for 1st parameter.

The card above is repeated until all corresponding y-values for the x-values read in previously have been entered.

Next the x-values and the associated y-values (unit quality) for the 2,3, ...9 parameters are entered in an identical manner. For the last parameter this input would be:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1-10	TABLE (1,1,9)	F10.0	First value of x-scale for the 9th parameter.
11-20	TABLE (2,1,9)	F10.0	Second value of x-scale for the 9th parameter.
.	.	.	.
.	.	.	.
.	.	.	.
71-80	TABLE (8,1,9)	F10.0	Eighth value of x-scale for the 9th parameter.

As previously, the above card is repeated if necessary.

Next the y-values for the corresponding x-values are entered:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1-10	TABLE (1,2,9)	F10.0	Corresponding 1st value of y-scale for 9th parameter.
11-20	TABLE (2,2,9)	F10.0	Corresponding 2nd value of y-scale for 9th parameter.
.	.	.	.
.	.	.	.
.	.	.	.
71-80	TABLE (8,2,9)	F10.0	Corresponding 8th value of y-scale for 9th parameter.

Again, as in the first parameter, the above card is repested if it was necessary in inputting the x-scale for this parameter.

4) Y-AXIS PARAMETER LABEL (if IPLOT 0)

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1-20	PTITLE (1,1-5)	5A4	Y-axis label for first parameter in character balanced notation (see sample input in next section or reference 2)
1-20	PTITLE (2,1-5)	5A4	Y-axis label for second parameter.
.	.	.	.
.	.	.	.
.	.	.	.
1-20	PTITLE (2,1-5)	5A4	Y-axis label for ninth parameter.

NOTE: The titles above must be in the same sequence as the parameters were specified on the storet retrieval.

5) STORET "MORE = 3" RETRIEVAL

This retrieval must have preceded as a seperate step or a seperate job altogether. In this program it will be referred to as input file (20). See deck setup following this section for details.

SAMPLE INPUT

1) Deck setup for program execution from source statements;

```
//EPAIII   JOB ('AAAA')
//STEP1 EXEC IPP906G
//FORT.SYSIN DD *
.                              .                               .
.                              .                               .
.                              .                               .
                     SOURCE DECK GOES HERE
.                              .                               .
.                              .                               .
.                              .                               .
//GO.FT20F001 DD DSN=(FILE NAME FROM STORET RETRIEVAL GOES HERE),
// UNIT=3330-1,DISP=OLD,LABEL=(,,,IN)
//GO.FT08F001 DD *
33.  37.  45.  57.  69.  78.  83.  81.  73.  60.  46.  34.
010101
0.0       20.0      30.0      40.0      50.0      60.0      78.0      80.0
100.0     120.0     140.0
3.0       12.0      20.0      30.0      44.0      60.0      75.0      86.0
100.0     89.0      73.0
1.0       2.0       5.0       10.0      20.0      50.0      100.0     300.0
500.0     1000.0    2000.0    5000.0    10000.0   20000.0   100000.0
100.0     88.0      77.0      68.0      58.0      47.0      40.0      30.0
26.0      21.0      18.0      12.0      9.0       7.0       5.0
2.0       3.0       3.3       4.0       4.5       5.0       5.5       6.0
6.4       7.0       7.2       7.4       7.8       8.0       8.5       9.0
10.0      10.5      11.0      12.0
2.0       4.0       7.0       10.0      16.0      27.0      42.0      62.0
80.0      91.0      93.0      94.0      90.0      87.0      80.0      45.0
18.0      10.0      6.0       3.0
0.0       5.        10.       15.       20.       25.       30.
100.      53.       31.       18.       11.       7.        5.
0.0       5.0       10.       20.       30.       40.       50.       60.
70.       80.       90.       100.
100.      66.       49.       32.       23.       17.       12.       7.
4.        2.0       1.2       1.1
0.0       .5        1.        2.        3.        4.        5.        6.
7.        8.        9.        10.
100.      60.       41.       25.       18.       12.       10.       8.
7.        6.        5.        4.
0.0       1.25      2.5       5.0       6.25      7.5       8.9       10.0
12.5      15.0      17.5      20.0
52.0      71.0      81.0      93.0      86.0      76.0      50.0      40.0
26.0      18.0      12.0      9.0
0.0       10.       20.       30.       40.       50.       60.       70.
80.       90.       100.
100.      77.       62.       52.       44.       38.       32.       28.
24.       20.       17.
0.0       50.       100.      150.      200.      250.      300.      350.
400.      450.      500.
80.       86.       84.       81.       74.       68.       61.       54.
47.       39.       33.
/D.O.  PERCENT SAT/
+FECAL COLI  MPN/ML+
/      PH         /
+    BOD5  MG/L  +
+     NO3  MG/L  +
+     PO4  MG/L  +
/EQUIL TEMP DELTA /
/  TURBIDITY   JTU/
+ TOT SOLIDS  MG/L+

//PLOT.FT07F001 DD SYSOUT=(K,,6129)
```

2) DECK SETUP FOR PROGRAM EXECUTION FROM LOAD MODULE:

```
//EPAIII   JOB ('AAAA')
//STEP1 EXEC PGM=WQI1OPLT,REGION=150K
//STEPLIB DD DSN=CN.EPAGAN.R2TW.WQMODL,DISP=SHR
//FT01F001 DD DDNAME=SYSIN,DCB=BLKSIZE=80
//FT06F001 DD SYSOUT=A
//FT07F001 DD SYSOUT=B
//FT16F001 DD SYSOUT=B
//FT15F001 DD SYSOUT=A
//FT02F001 DD DSN=&IPPTAPE,UNIT=SYSDA,SPACE=(CYL,(1,1),RLSE),
// DCB=(RECFM=VSB,LRECL=516,BLKSIZE=3156,DSORG=PS),
// DISP=(NEW,PASS,DELETE)
//FT20F001 DD DSN=(FILE NAME FROM STORET RETRIEVAL GOES HERE),
// UNIT=3330-1,DISP=OLD,LABEL=(,,,IN)
//FT08F001 DD *
33.  37.  45.  57.  69.  78.  83.  81.  73.  60.  46.  34.
010101
0.0       20.0      30.0      40.0      50.0      60.0      78.0      80.0
100.0     120.0     140.0
3.0       12.0      20.0      30.0      44.0      60.0      75.0      86.0
100.0     89.0      73.0
1.0       2.0       5.0       10.0      20.0      50.0      100.0     300.0
500.0     1000.0    2000.0    5000.0    10000.0   20000.0   100000.0
100.0     88.0      77.0      68.0      58.0      47.0      40.0      30.0
26.0      21.0      18.0      12.0      9.0       7.0       5.0
2.0       3.0       3.3       4.0       4.5       5.0       5.5       6.0
6.4       7.0       7.2       7.4       7.8       8.0       8.5       9.0
10.0      10.5      11.0      12.0
2.0       4.0       7.0       10.0      16.0      27.0      42.0      62.0
80.0      91.0      93.0      94.0      90.0      87.0      80.0      45.0
18.0      10.0      6.0       3.0
0.0       5.        10.       15.       20.       25.       30.
100.      53.       31.       18.       11.       7.        5.
0.0       5.0       10.       20.       30.       40.       50.       60.
70.       80.       90.       100.
100.      66.       49.       32.       23.       17.       12.       7.
4.        2.0       1.2       1.1
0.0       .5        1.        2.        3.        4.        5.        6.
7.        8.        9.        10.
100.      60.       41.       25.       18.       12.       10.       8.
7.        6.        5.        4.
0.0       1.25      2.5       5.0       6.25      7.5       8.9       10.0
12.5      15.0      17.5      20.0
52.0      71.0      81.0      93.0      86.0      76.0      50.0      40.0
26.0      18.0      12.0      9.0
0.0       10.       20.       30.       40.       50.       60.       70.
80.       90.       100.
100.      77.       62.       52.       44.       38.       32.       28.
24.       20.       17.
0.0       50.       100.      150.      200.      250.      300.      350.
400.      450.      500.
80.       86.       84.       81.       74.       68.       61.       54.
47.       39.       33.
/D.O.  PERCENT SAT/
+FECAL COLI  MPN/ML+
/      PH        /
+    BOD5  MG/L  +
+     NO3  MG/L  +
+     PO4  MG/L  +
/EQUIL TEMP DELTA /
/  TURBIDITY   JTU/
+ TOT SOLIDS  MG/L+

//STEP2 EXEC PGM=CMP906A,REGION=100K,COND=(8,LE)
//STEPLIB DD DSN=CN.EPACAW.SASS.IPP.LODMOD,DISP=SHR
//FT01F001 DD DDNAME=SYSIN,DCB=BLKSIZE=80
//FT02F001 DD DSN=&IPPTAPE,DISP=(OLD,DELETE,DELETE)
//FT06F001 DD SYSOUT=A
//FT07F001 DD SYSOUT=(K,,6129)
//FT10F001 DD DUMMY
//FT15F001 DD SYSOUT=A
//FT03F001 DD DDNAME=PLOTTAPE
//PLOTTAPE DD SYSOUT=B
```

PROGRAM D: Plot/Print NSF-WQI Time Profile and Parameter Data

SAMPLE OUTPUT

```
STATION 343017
                                                        343017          88
                                                        40 29 50.0 074 26 18.0 2
                                                        RARITAN RIVER (R17)
                                                        34023   NEW JERSEY
                                                        NORTHEAST                 013391
                                                        LOWER HUDSON N.Y. METROPOLITAN AREA
/TYPA/AMBNT/STREAM                                      21NJDEP1
                                                         0000 FEET  DEPTH  CLASS 00

    DATE     TIME   D O (SAT)   F.C. MPN     PH      BOD5      NO3      PO4    TEMP DELTA   TURB  TOT SOLIDS   CL   WQAI
  10/10/66            62.4780       330.    7.30      6.0    1.2400   0.4000     2.7557     24.5      523.0    0.    56.
   1/17/67            95.6182     16090.    7.90      4.0    0.9200   0.9000     2.5556     17.0      253.0    0.    54.
   5/24/67            91.6987      9180.    7.40      5.0    0.8000   0.2000    10.0557      6.6      280.0    0.    55.
   9/11/67            70.5822     16090.    7.30      6.0    1.2800   0.9000     8.7780      6.3      361.0    0.    47.
  10/23/67            64.3165     24000.    7.30      6.0    1.0000   0.9000     6.5557     26.0      404.0    0.    46.
   3/ 5/68            81.4680     24000.    7.20      9.0    1.0000   0.0        8.2223     16.0      292.0    0.    52.
   2/ 4/69            84.2123     24000.    7.30      8.0    2.0000   2.0000     6.7778    140.0      381.0    0.    37.
   5/14/69           126.5480     24000.    7.40      5.0    1.0000   1.0000     7.5557     17.0      392.0    0.    49.
  12/ 3/69            74.8414      2300.    7.40      4.0    1.0000   0.0        3.8334     12.0      850.0    0.    58.
  10/ 7/70            65.1528       490.    7.40      6.0    4.0000   0.0        1.5557     10.0     1838.0    0.    57.
   4/26/71            91.7934        50.    7.90      4.0    3.0000   1.0000     7.8890     16.0      326.0    0.    66.
   8/17/71           152.0962       170.    7.70      4.0    6.0000   0.9000     6.2224     16.0      450.0    0.    56.
  11/11/71            81.0493       130.    7.60      2.0    4.0000   0.5400     6.7778     16.0      272.0    0.    69.
   2/14/72            84.9141      2400.    6.90      5.0    4.0000   0.4800     6.7778    120.0      274.0    0.    48.
   3/27/73            89.6095         2.    6.90      2.0    1.5000   0.5000     2.2223     54.0      204.0    0.    77.
   9/27/73            47.8543       240.    7.30      2.0    2.0000   1.2000     9.7780      6.0      532.0    0.    50.
  12/13/73            85.1193      1600.    7.40      3.0    1.4000   0.5000     6.3334     17.0      206.0    0.    64.
```

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```
STATION 343024
                                                                343024          95
                                                                40 30 55.0 074 17 28.0 2
                                                                RARITAN RIVER
                                                                34023   NEW JERSEY
                                                                NORTHEAST                     013391
/TYPA/AMBNT/STREAM                                              LOWER HUDSON N.Y. METROPOLITAN AREA
                                                                21NJDEP1
                                                                 0000 FEET  DEPTH  CLASS 00

     DATE      TIME    D O (SAT)   F.C. MPN       PH         BOD5       NO3       PO4    TEMP DELTA  TURB  TOT SOLIDS    CL    WQAI
    1/10/67            60.7805      9180.        6.50        3.0      2.0800    0.9000     2.5556    43.0  21255.0       0.     45.
    5/10/67            74.5253     16090.        6.20        3.0      1.5200    0.3000    14.5557    40.0   8641.0       0.     40.
    9/12/67            65.1528      5420.        6.80        2.0      1.6600    0.0        8.7780    26.0  16200.0       0.     50.
   10/24/67            40.9287      2400.        7.60        2.0      1.0000    0.9000     6.5557    20.0  24730.0       0.     47.
    1/21/71    0945    70.9801       500.        6.70        4.0      5.0000    1.0000     5.5556    30.0  18980.0       0.     52.
    7/20/71            52.9542      2400.        7.70        3.0      2.0000    0.5600    10.3336    22.0  24220.0       0.     46.
    2/ 9/72    1040    72.3451       540.        7.40        3.0      1.5000    0.2400     7.7778    16.0  14206.0       0.     59.
    8/31/72            68.7224      1600.        7.10        4.0      4.0000    0.2400    12.2224    26.0  20878.0       0.     48.
   12/ 5/72            64.1078       920.        7.20        2.0      1.0000    0.2200     3.3334     6.0  13340.0       0.     60.
    2/ 6/73            93.3945       920.        6.80        2.0      1.0000    0.0200     4.7778    36.0  10640.0       0.     62.
    4/25/73           100.0118       540.        8.10        1.0      1.0000    0.3000     5.8890     8.0  21830.0       0.     65.
    7/26/73            60.0000       540.        7.80        2.0      1.5000    0.8000    11.3336     9.0  28910.0       0.     51.
   10/31/73            62.1056      2400.        6.50        1.0      1.0000    1.0000    10.5557    37.0   4726.0       0.     46.
    1/29/74            68.0168       540.        6.90        2.0      1.0000    0.5000     0.5556     7.0  21290.0       0.     57.
    5/15/74            79.3342       330.        7.50        2.0      1.0000    0.5000     4.4557    16.0    528.0       0.     62.
```

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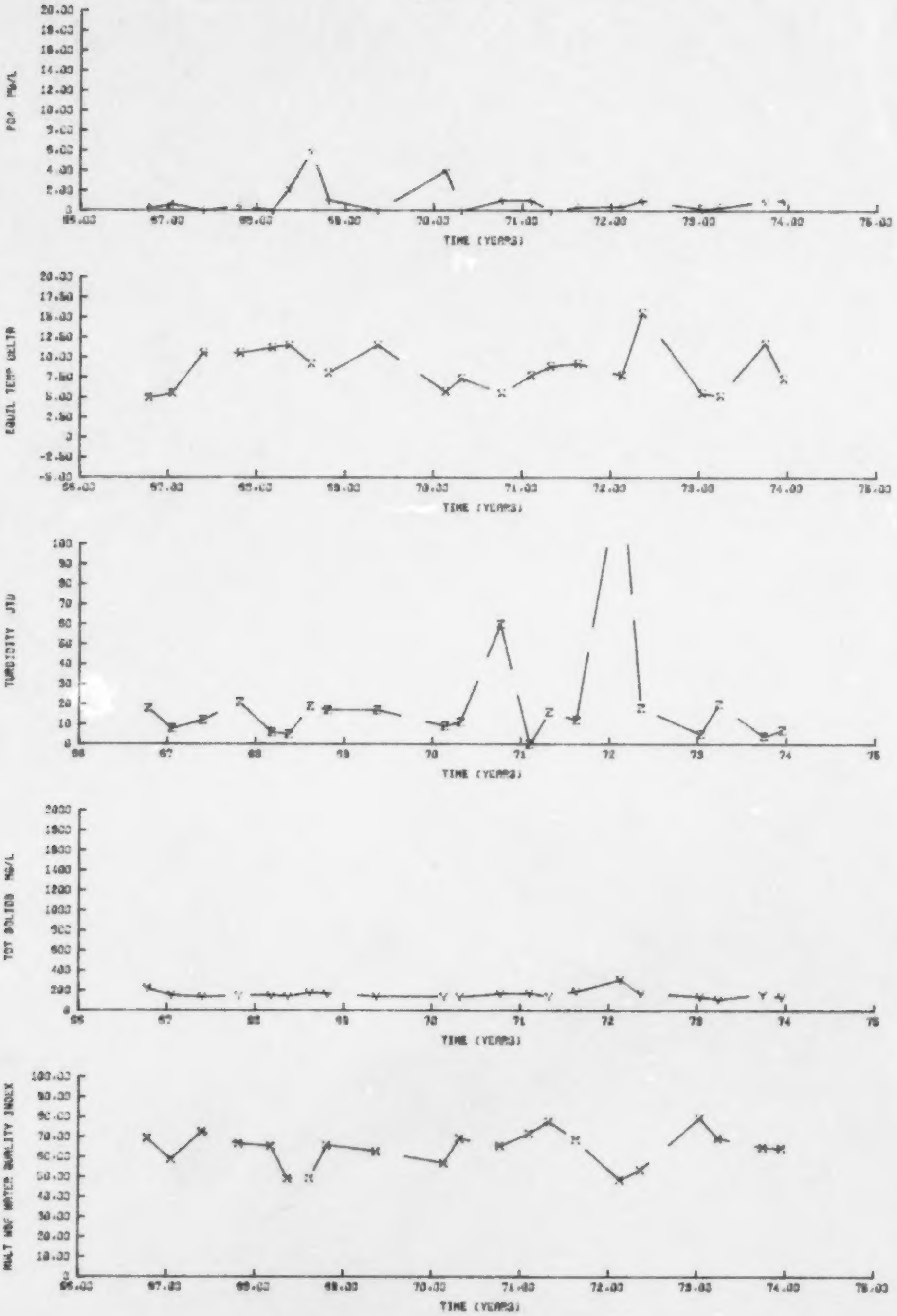
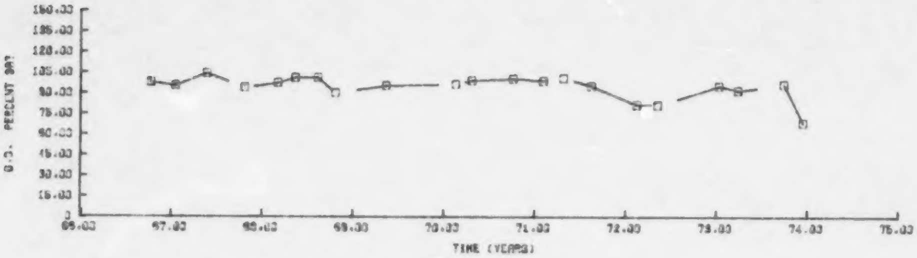
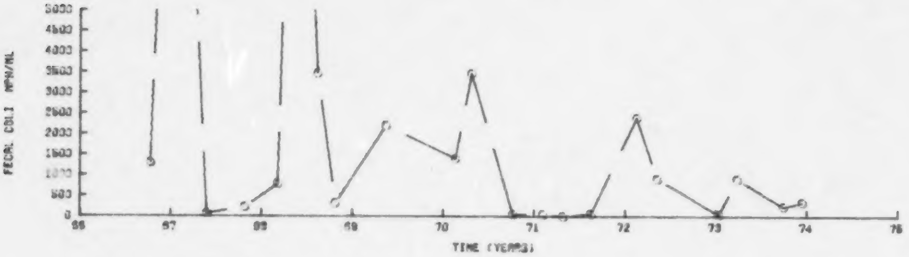
14113

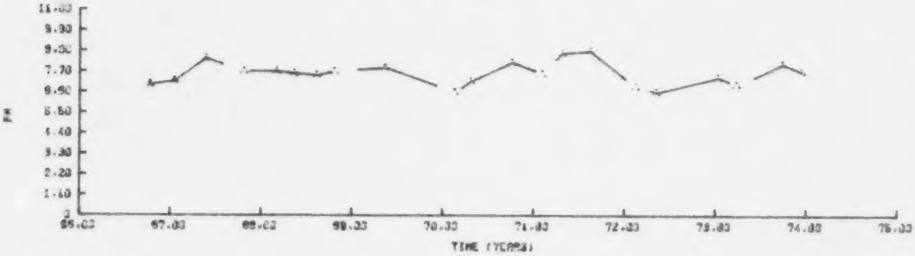
STORET STATION NO. 343014 RARITAN RIVER (R14)

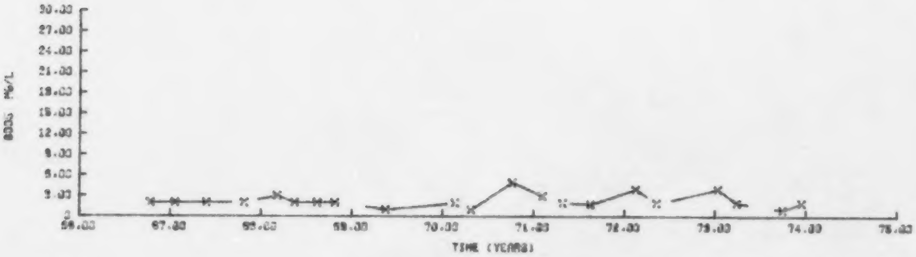


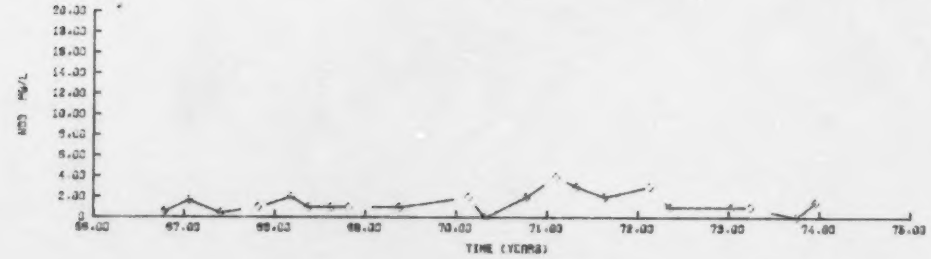
STORET STATION NO. 343014 RARITAN RIVER (R14)











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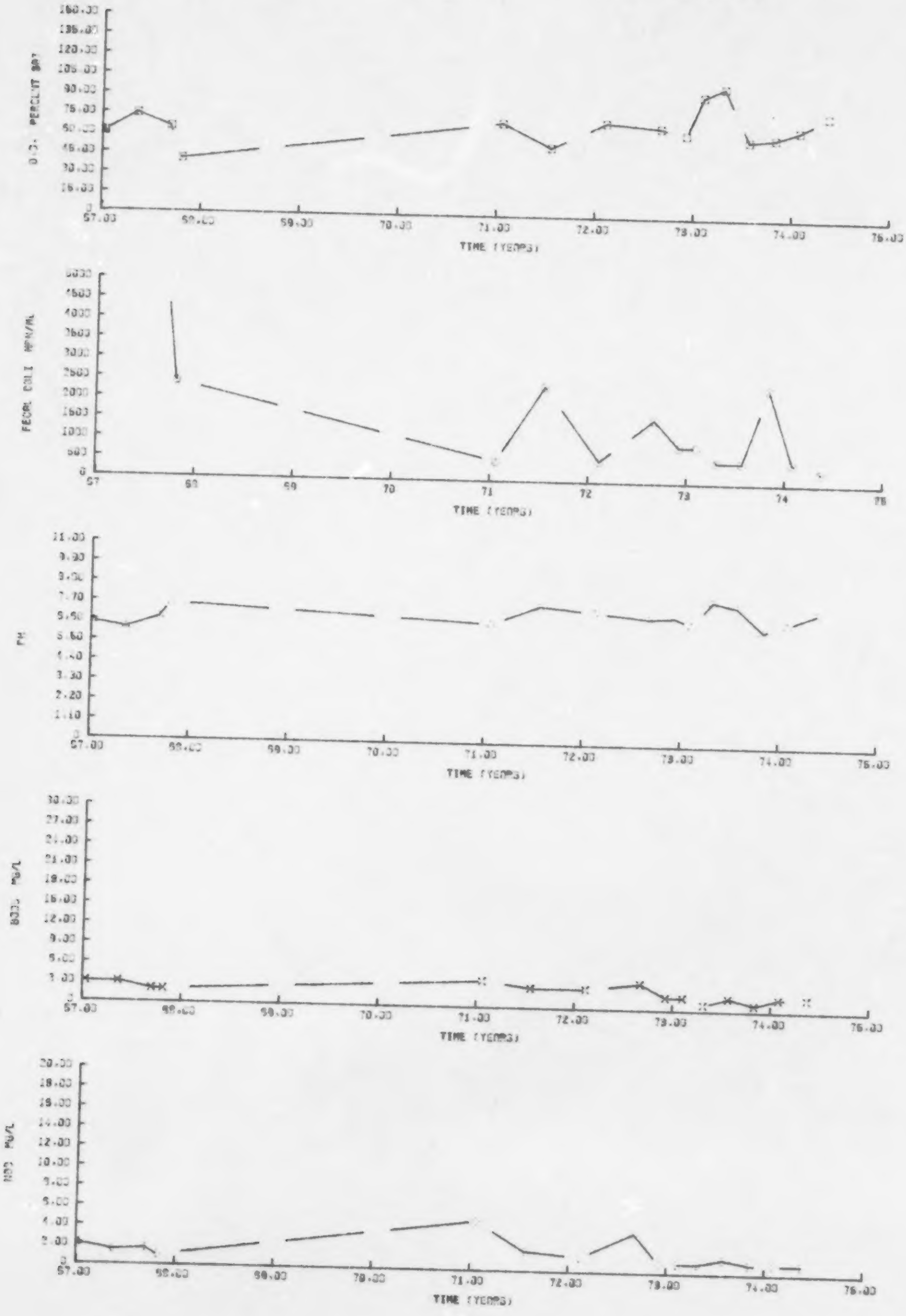
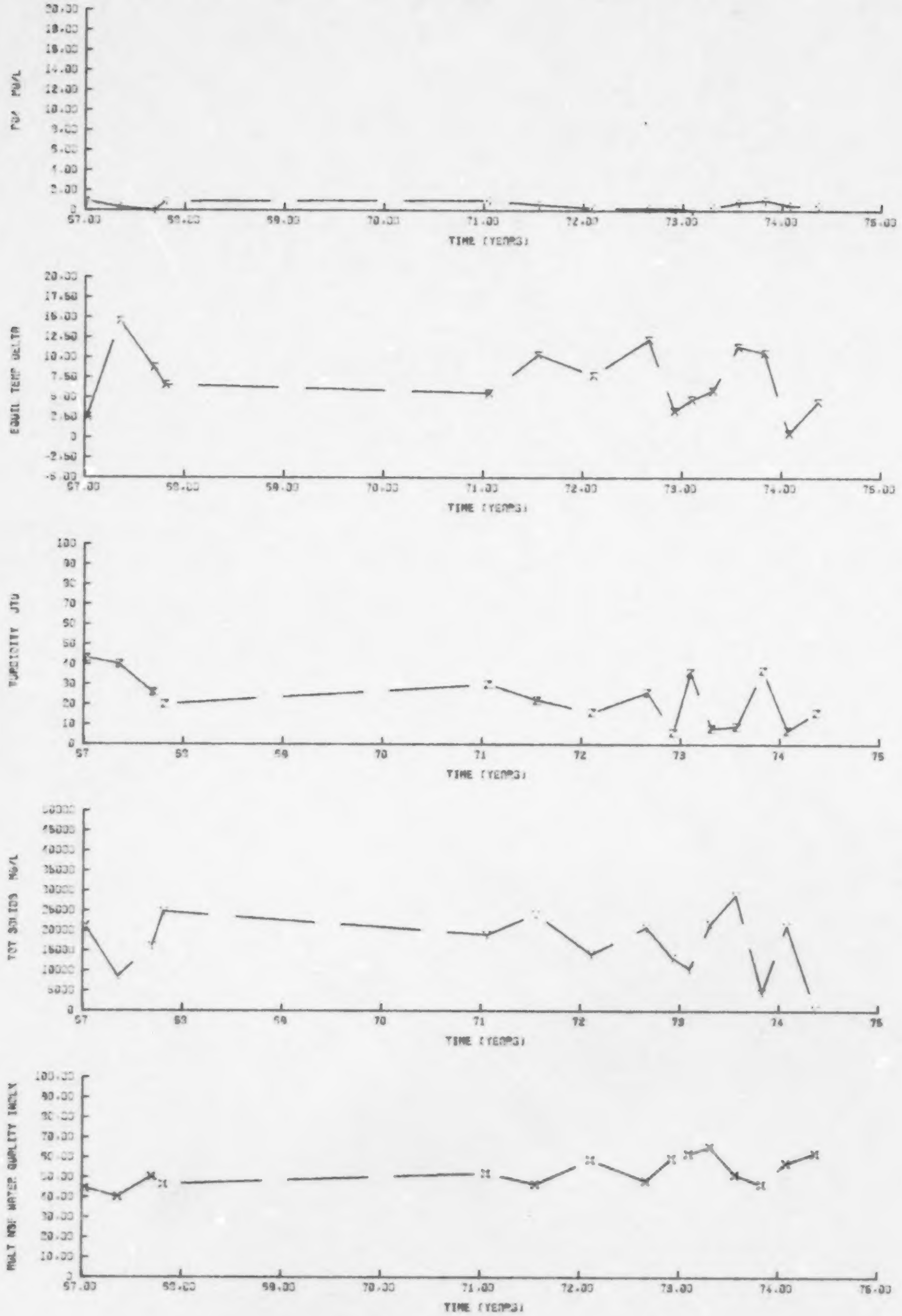


STORET STATION NO. 343024 RARITAN RIVER



PROGRAM D - SOURCE LISTING

```
C     ***************************************************************** PWQI001
C     ******************************************************************PWQI002
C                                                                       PWQI003
C     THIS PROGRAM PLOTS AND/OR PRINTS THE RAW DATA USED TO COMPUTE     PWQI004
C     THE WQI AT STORET STATIONS, FOR THE RETRIEVED TIME INTERVAL       PWQI005
C                                                                       PWQI006
C     *** THIS VERSION PLOTS UP TO FIVE PARAMETERS PER FRAME ***        PWQI007
C                                                                       PWQI008
C     ******************************************************************PWQI009
C     ***************************************************************** PWQI010
C                                                                       PWQI011
      INTEGER OPTION                                                    PWQI012
      DIMENSION PLDATA(30),SYMBOL(14),XXVAL(100),SCL(5),YYVAL(100)      PWQI013
      DIMENSION TOP(12),HIGHY(10),PTITLE(9,5),YTITLE(5),VAL(10,100)     PWQI014
      DIMENSION AGENCY(2),DESCRP(30),EQTEMP(12),PARAM(10),SMALL(9),     PWQI015
     1STAT(4),DAYS(12)                                                  PWQI016
      DIMENSION TABLE(20,2,9),MAXX(9),WEIGHT(9),QMAX(9),QUAL(9)         PWQI017
      DATA DAYS/31.,28.,31.,30.,31.,30.,31.,31.,30.,31.,30.,31./        PWQI018
      DATA SMALL/0.,1.,2.,0.,0.,0.,-10.,0.0,0.0/                        PWQI019
      DATA HIGHY/150., 5000.,11.,30.,20.,20.,20.,100.,50000.,100./      PWQI020
      DATA SKPTIM/'2500'/,SPACE/'    '/                                 PWQI021
      DATA SYMBOL/'Q','O','T','X','D','A','M','Z','Y','B','*','H','I'/  PWQI022
C     ******************************************************************PWQI023
C                                                                       PWQI024
C     THE NEXT STATEMENT HAS THE UNIT WEIGHT FACTORS FOR EACH PARAMETER PWQI025
C                                                                       PWQI026
C     ******************************************************************PWQI027
      DATA WEIGHT/.17,.15,.12,.10,.10,.10,.10,.08,.08/                  PWQI028
C     ******************************************************************PWQI029
C                                                                       PWQI030
C     THIS NEXT STATEMENT HAS THE MAXIMUM NUMBER OF POINTS IN EACH      PWQI031
C     UNIT QUALIGRAM  --  FOR PROGRAM CONTROL                           PWQI032
C                                                                       PWQI033
C     ******************************************************************PWQI034
      DATA MAXX/11,15,20,7,12,12,12,11,11/                              PWQI035
C     ******************************************************************PWQI036
C                                                                       PWQI037
C     THE NEXT DATA STATEMENT IS THE UNIT QUALITY, ASSIGNED TO A        PWQI038
C     PARAMETER EXCEEDING THE RANGES IN THE QUALIGRAMS                  PWQI039
C                                                                       PWQI040
C     ******************************************************************PWQI041
      DATA QMAX/50.,2.,0.,2.,1.,2.,5.,5.,20./                           PWQI042
      M=8                                                               PWQI043
      READ(M,9876)EQTEMP                                                PWQI044
 9876 FORMAT(12(F3.0,2X))                                               PWQI045
C                                                                       PWQI046
      READ(M,1)IPRNT,IPLOT,OPTION                                       PWQI047
    1 FORMAT(3I2)                                                       PWQI048
C     ******************************************************************PWQI049
C                                                                       PWQI050
C     READ INDIVIDUAL PARAMETER QUALIGRAMS                              PWQI051
C                                                                       PWQI052
C     ******************************************************************PWQI053
```

```
      DO 150  I=1,9
      MAX=MAXX(I)
C
C     FIRST -- THE X-SCALE IS READ INTO TABLE(J,1,I)
C
      READ(M,151)(TABLE(J,1,I),J=1,MAX)
  151 FORMAT(8F10.0)
C
C     NOW READ IN THE ASSOCIATED Y VALUE FOR THE X'S ABOVE
C
      READ(M,151)(TABLE(J,2,I),J=1,MAX)
  150 CONTINUE
C     ******************************************************************
C
C     READ Y-AXIS PARAMETER LABEL TO ARRAY IF PLOTING
C
C     ******************************************************************
      IF(IPLOT.GT.0)READ(M,4)((PTITLE(L,JX),JX=1,5),L=1,9)
    4 FORMAT(5A4)
      KK=0
      XXMAX=0.0
      YYMAX=0.0
C     ******************************************************************
C
C     CONVERT MONTHLY EQILIBRIUM TEMPERATURES TO DEGREES CENTIGRADE
C
C     ******************************************************************
      DO 7  I=1,12
      EQTEMP(I)=(EQTEMP(I)-32.)*.55556
    7 CONTINUE
C     ******************************************************************
C
C **READ DELIMITER RECORD - VERIFY BEGINNING OF DATA RECORDS**
C
C     ******************************************************************
 12   READ(20,111,END=400) IDUMMY
  111 FORMAT(25X,I2)
      IF (IDUMMY.EQ.99) GOTO 22
      GOTO 12
C
C     ******************************************************************
C     *** COMMANDS BELOW USE THE INTEGRATED PLOTTING PACKAGE ***
C
C     ******************************************************************
  232 IF(IPLOT.LE.0)GO TO 100
      HINIT=10.75
      LN=1
C     ******************************************************************
C
C     THIS NEXT CALL IS REQUIRED FOR PLOTS LARGER THAN 10.5 INCHES...
C
C     ******************************************************************
      CALL CMLBF('PLOT IS 8-1/2X11 IN. ')
```

```
C
C     SET INITIAL VALUES ON SPECIFICATIONS ARRAY
C
      CALL SSPECS(PLDATA)
      H17=PLDATA(17)/2.
      H18=PLDATA(18)/2.
C
C     ENTER NUMBER OF DATA POINTS TO PLOT
C
      PLDATA(13)=MM-1
C
C     MOVE Y-AXIS 1.5 INCHES AWAY FROM THE FRAME ORIGIN
C
      PLDATA(1)=1.5
C
C     RESET SIZE OF AXES (INCHES)
C
      PLDATA(7)=6.0
      PLDATA(8)=1.5
      DO 2  L=1,10
C
C     SET PLOTTING SYMBOL DESIRED
C
      PLDATA(16)=SYMBOL(L)
C
C     SET LETTER SIZE OF LABELS TO HALF DEFAULT (.05)
C
      PLDATA(17)=H17
      PLDATA(18)=H18
C
C     MOVE X-AXIS 8.75 INCHES AWAY FROM ORIGIN - USING 2.0 INCHES FOR
C     EACH GRAPH FOR A TOTAL FRAME SIZE OF 8-1/2 X 11 INCHES
C
      PLDATA(2)=HINIT-(LN*2.0)
C
C     CLEAR WORK AREA
C
      DO 15  K=1,5
   15 SCL(K)=0.0
C
C     SET RANGE OF VALUES ON X-AXIS ** NO. DIVISIONS=NO.YEARS ANALYZED
C
      KK=XXMAX+1
      PLDATA(3)=KK
      KK2=XXVAL(1)
      PLDATA(4)=KK2
      PLDATA(9)=KK-KK2
C
C     SET RANGE OF VALUES ON Y-AXIS
C
      PLDATA(5)=HIGHY(L)
C
C     TEST SOLIDS AMOUNT AT STATION -- RESET Y-SCALE IF NECESSARY
```

PROGRAM D - SOURCE LISTING

```
C                                                                       PWQI160
      IF(L.EQ.9.AND.VAL(9,1).LT.1000)PLDATA(5)=2000.                    PWQI161
      PLDATA(6)=0.0                                                     PWQI162
C                                                                       PWQI163
C     FOR TEMPERATURE CHANGE -- Y-SCALE MUST ACCOMODATE NEGATIVE VALUES PWQI164
C                                                                       PWQI165
      IF(L.EQ.7)PLDATA(6)=-5.0                                          PWQI166
C                                                                       PWQI167
C     SET NO. OF DECIMALS ON Y-AXIS DEPENDING ON PARAMETER ...          PWQI168
C                                                                       PWQI169
      PLDATA(28)=2.0                                                    PWQI170
      IF(L.EQ.2.OR.L.EQ.8.OR.L.EQ.9)PLDATA(28)=0.0                      PWQI171
C                                                                       PWQI172
C     CHANGE DEFAULT VALUE OF DIVISIONS FOR Y-AXIS                      PWQI173
C                                                                       PWQI174
      PLDATA(10) = 10.                                                  PWQI175
C                                                                       PWQI176
C     CLEAR ZONES -- UPDATED BY TITLES ON PREVIOUS GRAPH                PWQI177
C                                                                       PWQI178
      CALL ZZONES(PLDATA)                                               PWQI179
C                                                                       PWQI180
C     DRAW  X-Y  AXES                                                   PWQI181
C                                                                       PWQI182
      CALL AXLILI(PLDATA)                                               PWQI183
C                                                                       PWQI184
C     DRAW ANNOTATION NUMBERS AT THE BOTTOM SCALE MARKS                 PWQI185
C                                                                       PWQI186
      CALL NODLIB(PLDATA)                                               PWQI187
C                                                                       PWQI188
C     DRAW ANNOTATION NUMBER AT THE LEFT SCALE MARKS                    PWQI189
C                                                                       PWQI190
      CALL NODLIL(PLDATA)                                               PWQI191
C                                                                       PWQI192
C     CLEAR ZONES VARIABLES --  SINCE UPDATED BY ABOVE SUBROUTINE       PWQI193
C                                                                       PWQI194
      CALL ZZONES(PLDATA)                                               PWQI195
C                                                                       PWQI196
C     PLOT SYMBOL AT DATA POINT LOCATIONS                               PWQI197
C                                                                       PWQI198
      KK=MM-1                                                           PWQI199
      DO 6  K=1,KK                                                      PWQI200
      YYVAL(K)=VAL(L,K)                                                 PWQI201
    6 CONTINUE                                                          PWQI202
      CALL PSLILI(XXVAL,YYVAL,PLDATA)                                   PWQI203
C                                                                       PWQI204
C     NOW CONNECT DATA POINTS WITH DASHED LINE                          PWQI205
C                                                                       PWQI206
      CALL DLLILI(XXVAL,YYVAL,PLDATA)                                   PWQI207
C                                                                       PWQI208
C     CHANGE DEFAULT SPACING OF TITLES TO THE AXES                      PWQI209
C                                                                       PWQI210
      PLDATA(24)=.15                                                    PWQI211
      PLDATA(26)=.45                                                    PWQI212
```

```
C     ******************************************************************
C
C     NOW LABEL THE AXES ......
C
C     ******************************************************************
      CALL TITLEB('+  TIME (YEARS)+',PLDATA)
C
C     MOVE APPROPIATE Y-AXES LABEL TO VECTOR FOR PLOTTING
C
      IF (L.EQ.10) GO TO 2
      DO 8 JX=1,5
      YTITLE(JX)=PTITLE(L,JX)
    8 CONTINUE
      CALL TITLEL(YTITLE,PLDATA)
      IF(L.NE.5)GO TO 24
C
C     RESTORE TEXT LETTER SIZE FOR STATION DESCRIPTION LABEL
C
      PLDATA(17)=H17*2.
      PLDATA(18)=H18*2.0
C
C     PRINT GRAPH DESCRIPTION AT UPPER, RIGHT HAND SIDE OF GRAPH
C
      PLDATA(22)=1.75
      PLDATA(23)=10.5
      CALL GTITLE('+STORET STATION NO.+',PLDATA)
      PLDATA(22)=3.65
      CALL GTITLE(TOP,PLDATA)
C     ******************************************************************
C
C     ADVANCE GRAPH PAPER FOR NEXT FOUR PARAMETERS ...
C
C     ******************************************************************
      CALL NXTFRM(PLDATA)
      LN = 0
   24 LN=LN + 1
    2 CONTINUE
      IF(OPTION.EQ.0)CALL TITLEL('+CUMM NSF WATER QUALITY INDEX+',
     1PLDATA)
      IF(OPTION.NE.0)CALL TITLEL('+MULT NSF WATER QUALITY INDEX+',
     1PLDATA)
C
C     RESTORE TEXT LETTER SIZE FOR STATION DESCRIPTION LABEL
C
      PLDATA(17)=H17*2.
      PLDATA(18)=H18*2.0
C
C     PRINT GRAPH DESCRIPTION AT UPPER, RIGHT HAND SIDE OF GRAPH
C
      PLDATA(22)=1.75
      PLDATA(23)=10.5
      CALL GTITLE('+STORET STATION NO.+',PLDATA)
      PLDATA(22)=3.65
      CALL GTITLE(TOP,PLDATA)                                           PWQI266
C                                                                       PWQI267
C     ADVANCE GRAPH PAPER FOR NEXT STATION                              PWQI268
C                                                                       PWQI269
      CALL NXTFRM(PLDATA)                                               PWQI270
  432 STAT(1)=SPACE                                                     PWQI271
   22 READ(20,30,END=330) AGENCY,STAT,DESCRP                            PWQI272
 30   FORMAT(2A4,4A4,1X,30A4)                                           PWQI273
      MM=1                                                              PWQI274
      IF(IPRNT.GT.0) WRITE(6,40) STAT,DESCRP                            PWQI275
 40   FORMAT('1STATION ',4A4,/,' ',30A4)                                PWQI276
      DO 60 I=1,8                                                       PWQI277
      READ(20,30,END=310) AGENCY,STAT,DESCRP                            PWQI278
      IF(IPRNT.GT.0) WRITE(6,50) DESCRP                                 PWQI279
 50   FORMAT(' ',30A4)                                                  PWQI280
      IF(I.EQ.2.AND.IPLOT.GT.0)GO TO 61                                 PWQI281
      GO TO 60                                                          PWQI282
   61 TOP(1)=SYMBOL(4)                                                  PWQI283
      TOP(2)=STAT(1)                                                    PWQI284
      TOP(3)=STAT(2)                                                    PWQI285
      TOP(4)=SPACE                                                      PWQI286
      TOP(5)=DESCRP(17)                                                 PWQI287
      TOP(6)=DESCRP(18)                                                 PWQI288
      TOP(7)=DESCRP(19)                                                 PWQI289
      TOP(8)=DESCRP(20)                                                 PWQI290
      TOP(9)=DESCRP(21)                                                 PWQI291
      TOP(10)=DESCRP(22)                                                PWQI292
      TOP(11)=DESCRP(23)                                                PWQI293
      TOP(12)=SYMBOL(4)                                                 PWQI294
 60   CONTINUE                                                          PWQI295
C     PRINT HEADINGS IF PRINTING RAW DATA ...                           PWQI296
      IF(IPRNT.GT.0)WRITE(6,5)                                          PWQI297
    5 FORMAT(    5X,'  DATE  ',3X,'TIME',3X,'D O (SAT)',3X,'F.C. MPN',  PWQI298
     17X,'PH',9X,'BOD5',7X,'NO3',8X,'PO4',3X,'TEMP DELTA',3X,'TURB',    PWQI299
     22X,'TOT SOLIDS',3X,'CL',3X,'WQAI')                                PWQI300
      DO 90  I=1,9                                                      PWQI301
      QUAL(I)=0.0                                                       PWQI302
   90 CONTINUE                                                          PWQI303
C     ****************************************************************** PWQI304
C                                                                       PWQI305
C     READ STATION PARAMETRIC DATA                                      PWQI306
C                                                                       PWQI307
C     ****************************************************************** PWQI308
  100 READ(20,110,END=310) AGENCY,STAT,IYR,IMON,IDAY,TIME,PARAM         PWQI309
  110 FORMAT(2A4,3A4,A3,2X,3I2,A4,10A4)                                 PWQI310
      IF (IYR.EQ.99) GOTO 232                                           PWQI311
      DO 120 I=1,9                                                      PWQI312
C     ****************************************************************** PWQI313
C                                                                       PWQI314
C     TEST FOR DUMMY VALUE IF NO SAMPLE WAS TAKEN                       PWQI315
C                                                                       PWQI316
C     ****************************************************************** PWQI317
      IF ((PARAM(I).LT.1E-15).AND.(PARAM(I).GT.0.)) GOTO 100            PWQI318
      IF (PARAM(I).GE.0.) GOTO 120                                       PWQI319
      WRITE(6,115) I,PARAM(I)                                            PWQI320
115   FORMAT(' ***WARNING - PARAMETER ',I1,' IS NEGATIVE, ',F3.1         PWQI321
     1,' IS SUBSTITUTED***')                                             PWQI322
  120 CONTINUE                                                           PWQI323
      IF (TIME.EQ.SKPTIM) TIME=SPACE                                     PWQI324
C     ****************************************************************** PWQI325
C                                                                        PWQI326
C     TEST PARAMETERS FOR MINIMUM POSSIBLE VALUES  -- IF LESS ADJUST     PWQI327
C                                                                        PWQI328
C     ****************************************************************** PWQI329
      DO 156 I=1,9                                                       PWQI330
      IF (PARAM(I).LT.SMALL(I)) PARAM(I)=SMALL(I)                        PWQI331
156   CONTINUE                                                           PWQI332
C     ****************************************************************** PWQI333
C                                                                        PWQI334
C     COMPUTE SATURATION LEVEL OF OXYGEN AT STATION  --USING TEMPERATURE PWQI335
C     AND CHLORIDE CONCENTRATION                                         PWQI336
C                                                                        PWQI337
C     ****************************************************************** PWQI338
      DOSAT=(1.-.000009*PARAM(10))*(14.652-.41022*PARAM(7)               PWQI339
     1+.007991*PARAM(7)**2 -.000077774*PARAM(7)**3)                      PWQI340
C     ****************************************************************** PWQI341
C                                                                        PWQI342
C     COMPUTE OXYGEN CONCENTRATION AS PERCENT SATURATION                 PWQI343
C                                                                        PWQI344
C     ****************************************************************** PWQI345
       PARAM(1)=PARAM(1)/DOSAT*100.                                      PWQI346
C     ****************************************************************** PWQI347
C                                                                        PWQI348
C     COMPUTE DEVIATION FROM EQUILIBRIUM TEMPERATURE                     PWQI349
C                                                                        PWQI350
C     ****************************************************************** PWQI351
      PARAM(7)=EQTEMP(IMON) - PARAM(7)                                   PWQI352
C     ****************************************************************** PWQI353
C                                                                        PWQI354
C     ADD CONSTANT OF '5' TO TEMPERATURE VALUES -- NOTE - THIS IS DONE   PWQI355
C     TO ELIMINATE NEGATIVE TEMPERATURES IN UNIT QUALIGRAM               PWQI356
C     X-SCALE OF TEMPERATURE QUALIGRAM HAS ALSO BEEN CHANGED ACCORDINGLY PWQI357
C                                                                        PWQI358
C     ****************************************************************** PWQI359
      PARAM(7)=PARAM(7)+5.                                               PWQI360
      IF(PARAM(7).LT.0)PARAM(7)=0                                        PWQI361
C     ****************************************************************** PWQI362
C                                                                        PWQI363
C     SEARCH FOR QUALITY VALUE --  LINEARLY INTERPOLATE IF NECESSARY     PWQI364
C                                                                        PWQI365
C     ****************************************************************** PWQI366
      DO 285 IPARAM=1,9                                                  PWQI367
      MAX=MAXX(IPARAM)                                                   PWQI368
      DO 157  ISCAN=1,MAX                                                PWQI369
      IF(PARAM(IPARAM).GT.TABLE(ISCAN,1,IPARAM))GO TO 157                PWQI370
      IF(PARAM(IPARAM).LT.TABLE(ISCAN,1,IPARAM))GO TO 158                PWQI371
      QUAL(IPARAM)=TABLE(ISCAN,2,IPARAM)
      GO TO 285
  157 CONTINUE
C     ******************************************************************
C
C     SET QUALITY OF PARAMETER FOR VALUE ABOVE DEFINED MAXIMUM
C
C     ******************************************************************
      QUAL(IPARAM)=QMAX(IPARAM)
      GO TO 285
C     ******************************************************************
C
C     PARAMETER IS BETWEEN TWO VALUES -- LINEARLY INTERPOLATE FOR UNIT
C     QUALITY BY USING THE HIGH VALUE AND SUBTRACTING THE DIFFERENCE
C
C     ******************************************************************
  158 XDIF=TABLE(ISCAN,1,IPARAM)-PARAM(IPARAM)
      XDELTA=TABLE(ISCAN,1,IPARAM)-TABLE(ISCAN-1,1,IPARAM)
      SLOPE=(TABLE(ISCAN,2,IPARAM)-TABLE(ISCAN-1,2,IPARAM))/XDELTA
      QUAL(IPARAM)=TABLE(ISCAN,2,IPARAM)-(SLOPE*XDIF)
285   CONTINUE
      WQIA=0.
C     ******************************************************************
C
C     TEST OPTION OF MULTIPLICATIVE OR ADDITIVE INDEX
C
C     ******************************************************************
      IF(OPTION.GT.0)GO TO 275
      DO 290 I=1,9
      WQIA=WQIA+QUAL(I)*WEIGHT(I)
290   CONTINUE
      GO TO 278
  275 WQIA=1.0
      DO 276  I=1,9
      WQIA=WQIA*QUAL(I)**WEIGHT(I)
  276 CONTINUE
C     ******************************************************************
C
C     TEST OPTION TO PRINT RAW DATA ...
C
C     ******************************************************************
  278 IF(IPRNT.GT.0)WRITE(6,3)IMON,IDAY,IYR,TIME,(PARAM(I),I=1,10),WQIA
    3 FORMAT(5X,I2,'/',I2,'/',I2,3X,A4,F11.4,F9.0,F11.2,F12.1,3F11.4,
     12F8.1,2F7.0)
      PARAM(10)=WQIA
C     ******************************************************************
C
C     DIGITIZE SAMPLE DATE TO FRACTION OF YEAR
C
C     ******************************************************************
      SUM=0.
      IF (IMON.EQ.1) GOTO 675
      INDEX=IMON-1
```

PROGRAM D - SOURCE LISTING

```
      DO 670 I=1,INDEX
      SUM=SUM+DAYS(I)
670   CONTINUE
675   CONTINUE
      SUM=SUM+IDAY
      IF ((MOD(IYR,4).EQ.0).AND.(IMON.GT.2)) SUM=SUM+1
      TOTDAY=365
      IF (MOD(IYR,4).EQ.0) TOTDAY=366
      FRAC=SUM/TOTDAY
  191 XXVAL(MM)=IYR+FRAC
      DO 9  JX=1,10
      VAL(JX,MM)=PARAM(JX)
    9 CONTINUE
C     SAVE HIGHEST OF YEARS FOR SCALING PLOT
      IF(XXVAL(MM).GT.XXMAX)XXMAX=XXVAL(MM)
      MM=MM+1
  192 GO TO 100
310   CONTINUE
      WRITE(6,320) STAT
320   FORMAT(//,' ABNORMAL FILE END WHILE READING STATION ',4A4)
      STOP
400   WRITE(6,112)
  112 FORMAT(10X,'BEGINNING OF DATA RECORDS NOT CONFIRMED')
C     *****************************************************************
C
C     IF NOT PLOTTING SET HI COND CODE TO  BYPASS PLOT POST-PROCESSOR
C
C     *****************************************************************
  330 IF(IPLOT.LE.0)STOP 40
C     *****************************************************************
C
C     PLOTTING IS FINISH  -- NOW CLOSE THE NEUTRAL TEXT
C
C     *****************************************************************
      CALL PPPEND(PLDATA)
  333 STOP
      END
```

SOURCE DECKS AT OSI

For the convenience of potential users, the source language statements for these four programs have been stored at the WCC computer facility as Alpha Data sets:

DATASET NAME	DESCRIPTION
CL.SLIB.EPAGAN(TIMEWQI)	PROGRAM A
CL.SLIB.EPAGAN(FIVEPARM)	PROGRAM B
CL.SLIB.EPAGAN(SEASONAL)	PROGRAM C
CL.SLIB.EPAGAN(WQIPARM)	PROGRAM D

Source decks may also be obtained from the EPA Region II Data Systems Branch office.

PROGRAM EXECUTION FROM LOAD MODULES

To save expenses in compilation and link-editing, these programs also exist as core-image modules on a partitioned data set at WCC as follows:

DATASET NAME	DESCRIPTION
CN.EPAGAN.R2TW.WQI.LOADLIB(TIMEWQI)	PROGRAM A
CN.EPAGAN.R2TW.WQI.LOADLIB(FIVEPARM)	PROGRAM B
CN.EPAGAN.R2TW.WQI.LOADLIB(SEASONAL)	PROGRAM C
CN.EPAGAN.R2TW.WQI.LOADLIB(WQIPARM)	PROGRAM D

The JCL procedure for the execution of these data sets with the proper plot post-processor is shown in the sample input sections.

INTERACTIVE PROCESSING WITH TEKTRONICS TERMINAL

These programs presently have limited interactive application under the Time Sharing Option at the WCC facility. The programs execute successfully, but because the plotting text is hardware generated by the Tektronics terminal and not drawn by the software, the resulting plots are unsatisfactory. These problems will hopefully be resolved once Calcomp preview procedures for the Tektronics terminal are implemented and at the WCC facility.

Application to the Raritan River Basin

The Raritan River Basin is the largest intra-state surface watershed in New Jersey. The mainstream section which is approximately 30 miles long extends from the River's mouth at Raritan Bay to the confluence of the north and south branches. Figure 2 is a map of the area showing the Raritan River Basin and its major tributaries. The six digit numbers in this figure are the STORET primary station numbers.

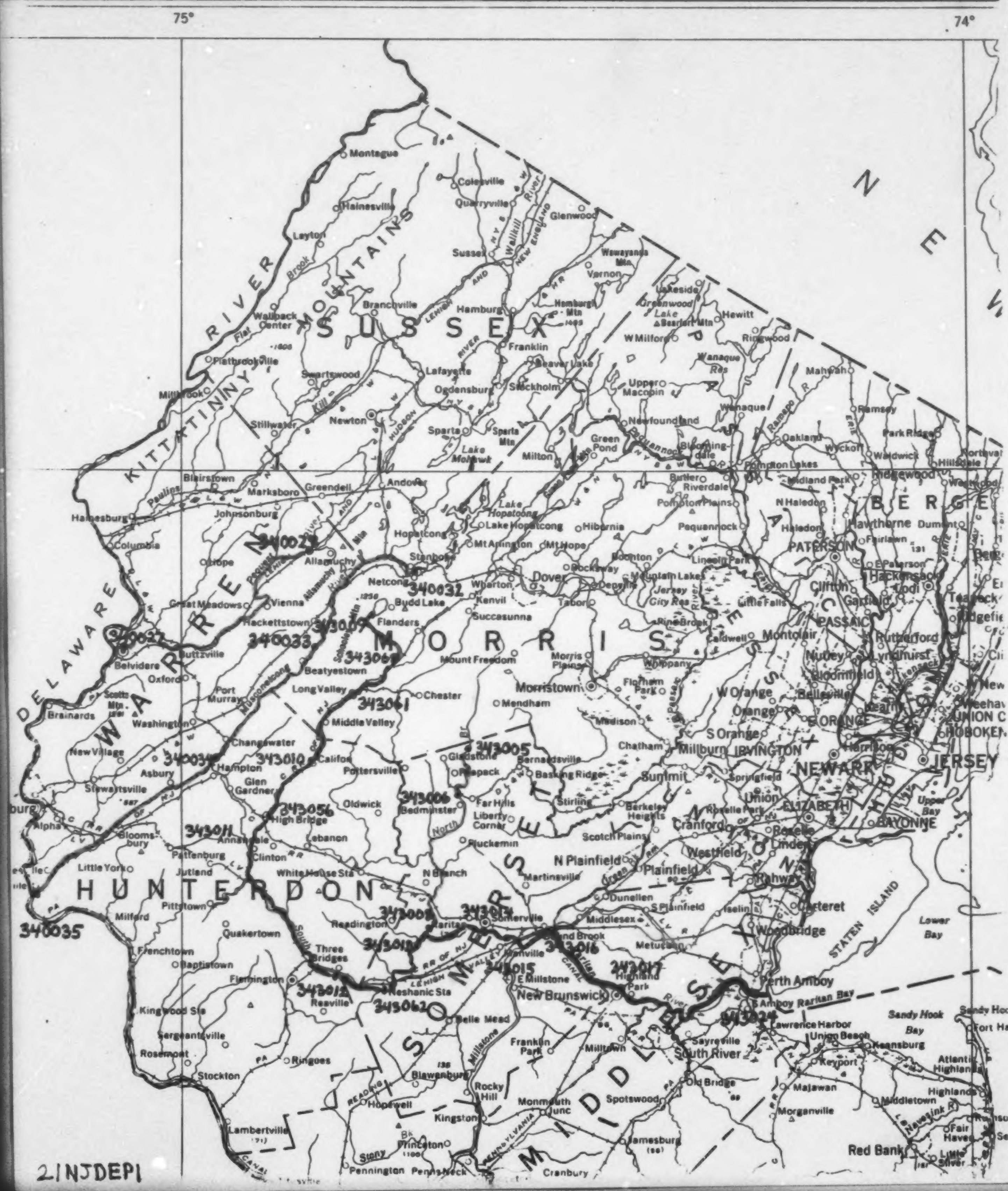
As a test application, the water quality parameters required were retrieved from the STORET system for these stations in the Raritan River South Branch and the mainstream. Programs A and C were processed using this data.

The water quality index profiles for winter and summer conditions for three separate time intervals:

1) 1968 - 1969
2) 1970 - 1972
3) 1973 - Present

are shown in the next four pages. The graphs by station number begin at the origin of the South Branch (the downstream end of Budd Lake) and ends at the Raritan Bay. The graphs by station mile point are in reverse order, they start at the mouth of the Raritan River and travel upstream to the origin of the South Branch. As expected, the index is overall higher during the winter season. Trends of the index as one goes up or down the Raritan Basin, as well as any changes during the defined time intervals can be easily assessed from these pages.

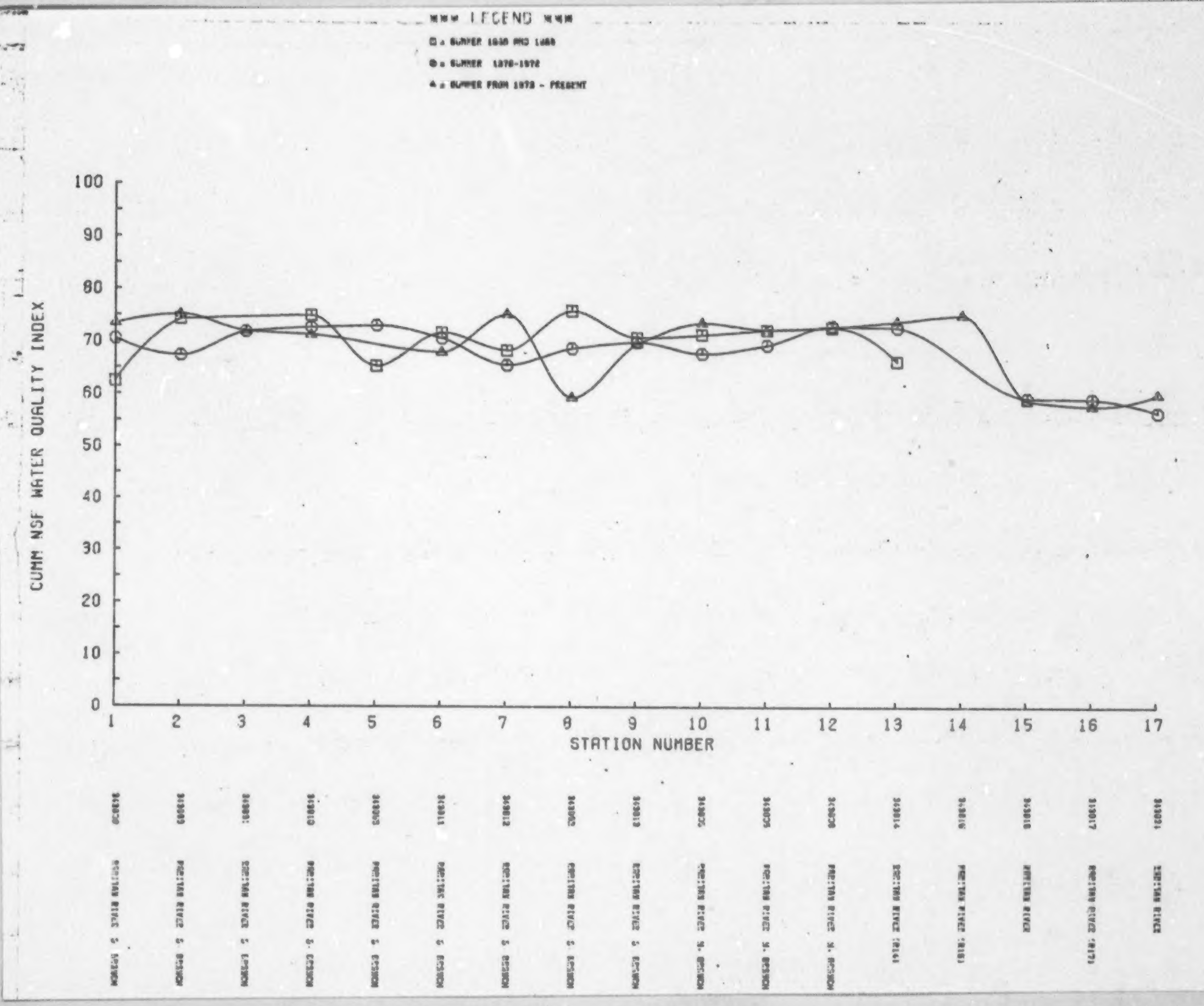
STATE OF NEW JERSEY

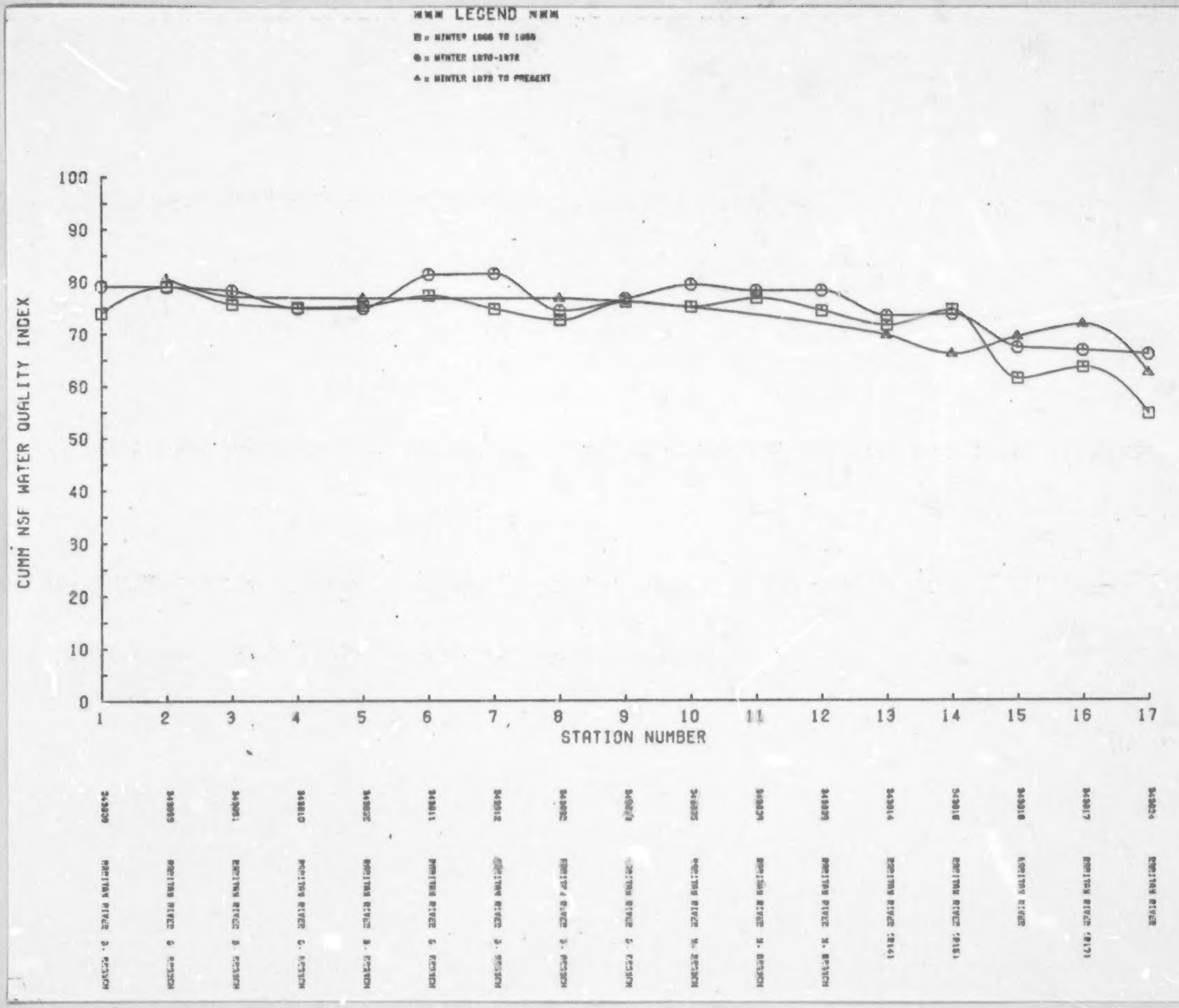

75°
74°
NEW
SUSSEX
WARREN
MORRIS
HUNTERDON
SOMERSET
MIDDLESEX
PASSAIC
ESSEX
UNION
HUDSON
BERGE
KITTATINNY
MOUNTAINS
DELAWARE
RIVER
STATEN ISLAND
Lower Bay
Sandy Hook Bay
Raritan Bay
Montague
Colesville
Hainesville
Quarryville
Glenwood
Layton
Sussex
Vernon
Branchville
Hamburg
Wallpack Center
Franklin
Lakeside
Hewitt
Ringwood
W Milford
Flatbrookville
Swartswood
Lafayette
Ogdensburg
Stockholm
Beaver Lake
Upper Macopin
Millbrook
Stillwater
Newton
Sparta
Milton
Green Pond
Newfoundland
Wanaque
Mahwah
Ramsey
Park Ridge
Oakland
Wyckoff
Waldwick
Hillsdale
Blairstown
Marksboro
Greendell
Andover
Butler
Riverdale
Pompton Lakes
Midland Park
Ridgewood
Hainesburg
Johnsonburg
Lake Hopatcong
Hibernia
Pompton Plains
N Haledon
Haledon
Hawthorne
Dumont
Columbia
Hopatcong
Mt Arlington
Mt Hope
Pequannock
PATERSON
Fairlawn
Hope
Allamuchy
Stanhope
Netcong
Wharton
Dover
Boonton
Rockaway
Mountain Lakes
Lincoln Park
Hackensack
Clifton
Lodi
Garfield
Teaneck
Vienna
Budd Lake
Kenvil
Succasunna
Denville
Tabor
Little Falls
Great Meadows
Hackettstown
Flanders
Pine Brook
Caldwell
Montclair
PASSAIC
Rutherford
Lyndhurst
Buttzville
Belvidere
Oxford
Beatyestown
Mount Freedom
Morris Plains
Whippany
Nutley
Bloomfield
Port Murray
Long Valley
Chester
Morristown
Florham Park
W Orange
Orange
Belleville
Brainards
Washington
Middle Valley
Mendham
Madison
S Orange
E ORANGE
Kearny
HOBOKEN
UNION C
Changewater
Chatham
Millburn
IRVINGTON
Harrison
NEWARK
JERSEY
New Village
Califon
Gladstone
Bernardsville
Asbury
Hampton
Pottersville
Peapack
Basking Ridge
Summit
Springfield
Glen Gardner
Stewartsville
Oldwick
Bedminster
Far Hills
Liberty Corner
Stirling
Berkeley Heights
Union
Roselle Park
ELIZABETH
BAYONNE
Alpha
High Bridge
Lebanon
Pluckemin
Cranford
Roselle
Bloomsbury
Annandale
Pattenburg
Clinton
Scotch Plains
Linden
Westfield
N Plainfield
Plainfield
Little York
Jutland
White House Sta
N Branch
Martinsville
Rahway
Milford
Pittstown
Dunellen
S Plainfield
Iselin
Carteret
Quakertown
Readington
Raritan
Somerville
Middlesex
Bound Brook
Woodbridge
Frenchtown
Baptistown
Three Bridges
Manville
Metuchen
Highland Park
Perth Amboy
Flemington
E Millstone
Neshanic Sta
Reaville
New Brunswick
S Amboy
Kingwood Sta
Belle Mead
Lawrence Harbor
Union Beach
Keansburg
Sergeantsville
Sayreville
South River
Keyport
Rosemont
Ringoes
Franklin Park
Milltown
Atlantic Highlands
Stockton
Blawenburg
Old Bridge
Matawan
Highlands
Rocky Hill
Monmouth Junc
Spotswood
Middletown
Hopewell
Kingston
Morganville
Lambertville
Princeton
Jamesburg
Red Bank
Fair Haven
Little Silver
Pennington
Penns Neck
Cranbury
Sandy Hook
Fort Ha
Navesink R
340022
340032
340027
340033
343007
343060
343061
343005
340034
343010
343006
343056
343011
340035
343008
343014
343013
343016
343017
343015
343012
343062
343024

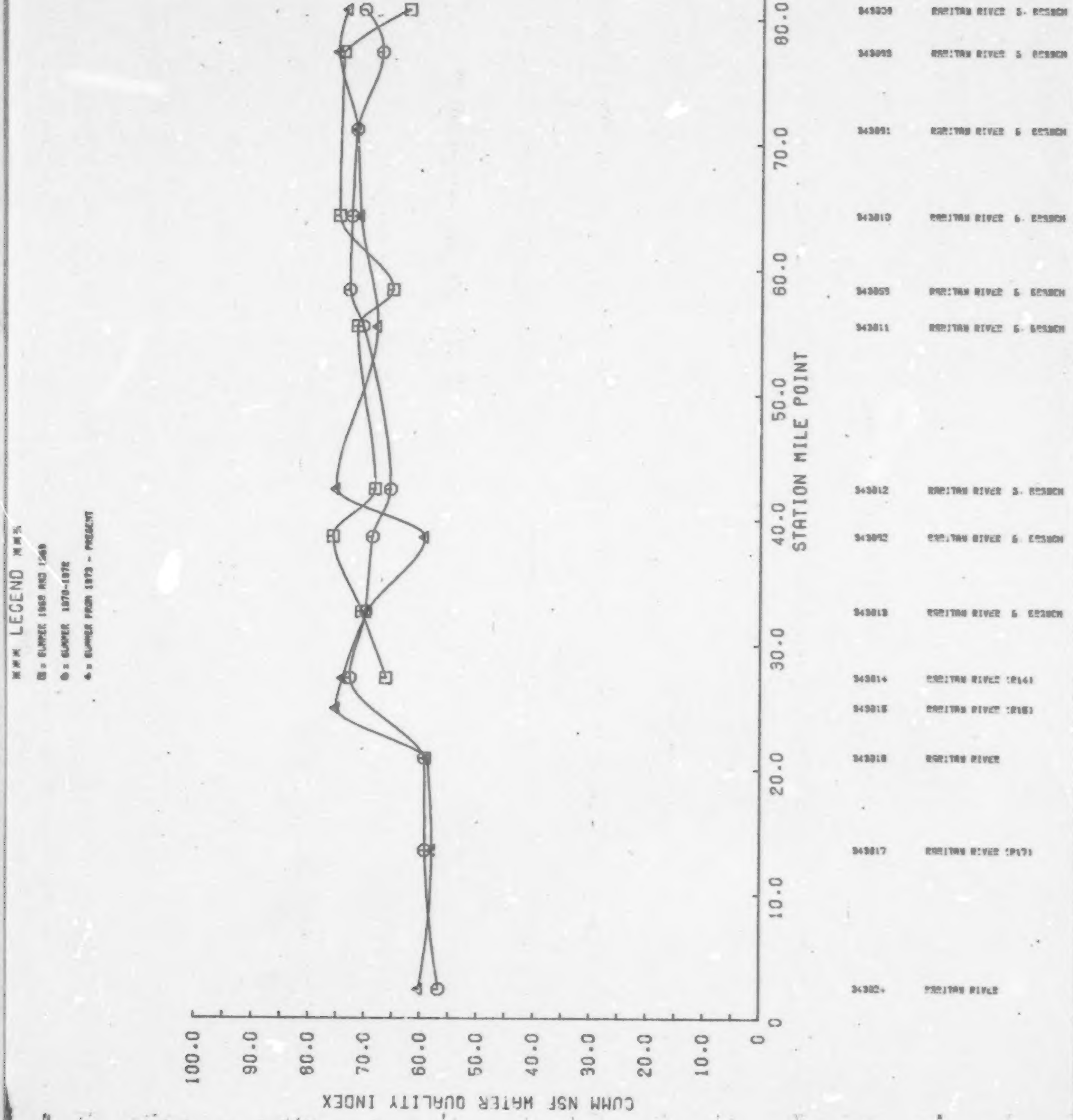
21NJDEP1

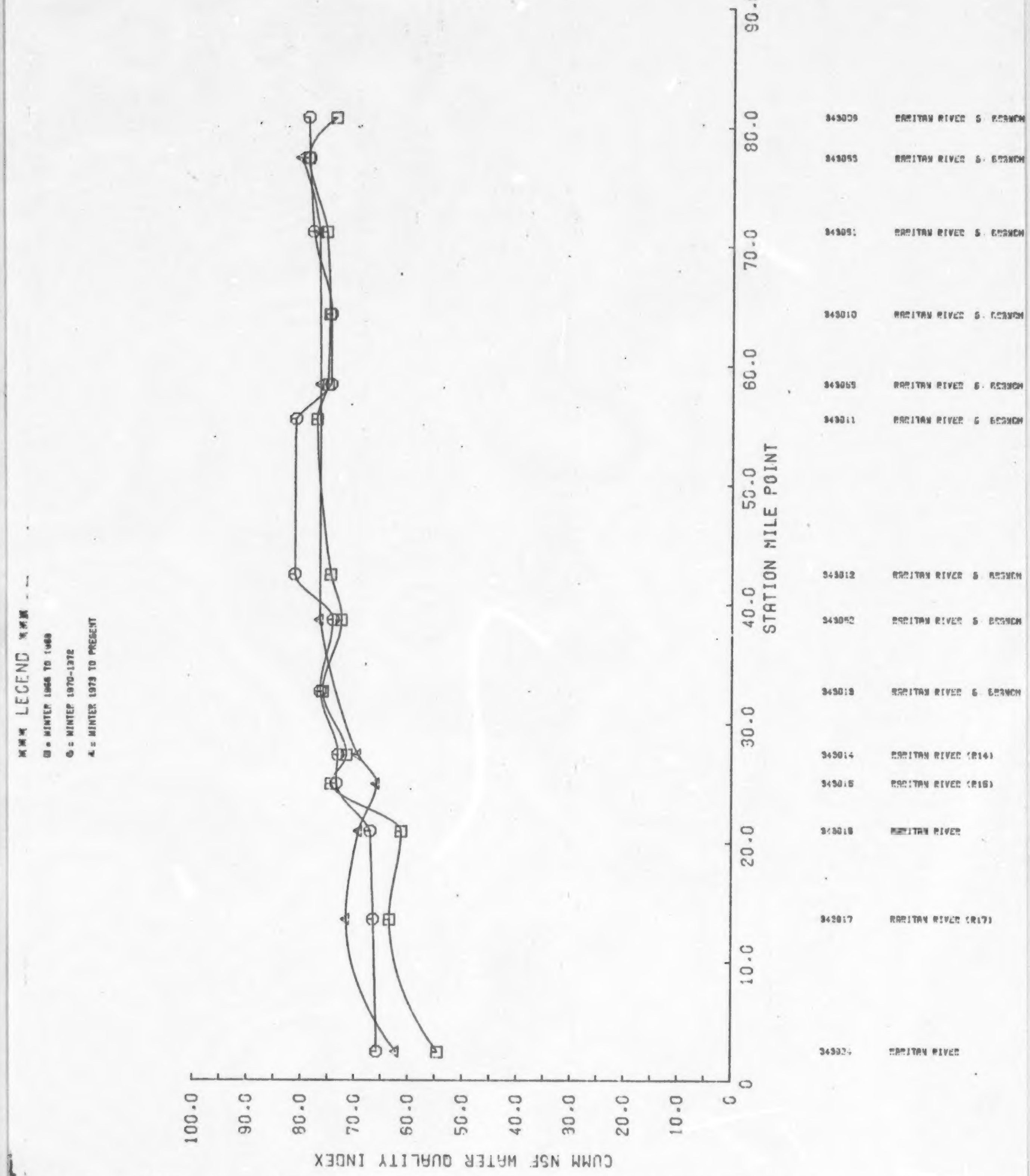
```
                                               INPUT CONTROL PARAMETERS
TOTAL NO. OF INTERVAL SETS =  3


*** CURVE NO.  1 ***

NO.  OF TIME INTERVALS FOR THIS SET=   2

FROM            TO
 6/ 1/68        9/30/68
 6/ 1/69        9/30/69

    PLOTTING FOR CURVE NO.  1 -- PROCESSED SUCCESSFULLY WITH  19 POINTS


*** CURVE NO.  2 ***

NO.  OF TIME INTERVALS FOR THIS SET=   3

FROM            TO
 6/ 1/70        9/31/70
 6/ 1/71        9/31/71
 6/ 1/72        9/31/72

    PLOTTING FOR CURVE NO.  2 -- PROCESSED SUCCESSFULLY WITH  45 POINTS


*** CURVE NO.  3 ***

NO.  OF TIME INTERVALS FOR THIS SET=   3

FROM            TO
 6/ 1/73        9/31/73
 6/ 1/74        9/31/74
 6/ 1/75        9/31/75

    PLOTTING FOR CURVE NO.  3 -- PROCESSED SUCCESSFULLY WITH  15 POINTS
```

```
                                                INPUT CONTROL PARAMETERS
TOTAL NO. OF INTERVAL SETS =  3


*** CURVE NO.  1 ***

NO.  OF TIME INTERVALS FOR THIS SET=   8

FROM          TO
11/ 1/66     12/31/66
 1/ 1/67      2/30/67
11/ 1/67     12/31/67
 1/ 1/68      2/30/68
11/ 1/68     12/31/68
 1/ 1/69      2/30/69
11/ 1/69     12/31/69
 1/ 1/70      2/30/70

    PLOTTING FOR CURVE NO.  1 -- PROCESSED SUCCESSFULLY WITH  58 POINTS


*** CURVE NO.  2 ***

NO.  OF TIME INTERVALS FOR THIS SET=   6

FROM          TO
11/ 1/70     12/31/70
 1/ 1/71      2/30/71
11/ 1/71     12/31/71
 1/ 1/72      2/30/72
11/ 1/72     12/31/72
 1/ 1/73      2/30/73

    PLOTTING FOR CURVE NO.  2 -- PROCESSED SUCCESSFULLY WITH  62 POINTS


*** CURVE NO.  3 ***

NO.  OF TIME INTERVALS FOR THIS SET=   6

FROM          TO
11/ 1/73     12/31/73
 1/ 1/74      2/30/74
11/ 1/74     12/31/74
 1/ 1/75      2/30/75
11/ 1/75     12/31/75
 1/ 1/76      2/30/76

    PLOTTING FOR CURVE NO.  3 -- PROCESSED SUCCESSFULLY WITH  19 POINTS
```


*** LEGEND ***
□ = SUMMER 1968 AND 1969
⊖ = SUMMER 1970-1972
△ = SUMMER FROM 1973 - PRESENT
CUMM NSF WATER QUALITY INDEX
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
STATION NUMBER
RARITAN RIVER S. BRANCH
RARITAN RIVER N. BRANCH
RARITAN RIVER (R14)
RARITAN RIVER (R16)
RARITAN RIVER
RARITAN RIVER (R17)


*** LEGEND ***
□ = WINTER 1966 TO 1969
⊕ = WINTER 1970-1972
△ = WINTER 1973 TO PRESENT
CUMM NSF WATER QUALITY INDEX
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
STATION NUMBER
343030 RARITAN RIVER S. BRANCH
343009 RARITAN RIVER S. BRANCH
343001 RARITAN RIVER S. BRANCH
343010 RARITAN RIVER S. BRANCH
343002 RARITAN RIVER S. BRANCH
343011 RARITAN RIVER S. BRANCH
343012 RARITAN RIVER S. BRANCH
343002 RARITAN RIVER S. BRANCH
343028 RARITAN RIVER S. BRANCH
343035 RARITAN RIVER N. BRANCH
343034 RARITAN RIVER N. BRANCH
343039 RARITAN RIVER N. BRANCH
343014 RARITAN RIVER (R14)
343015 RARITAN RIVER (R15)
343018 RARITAN RIVER
343017 RARITAN RIVER (R17)
343024 RARITAN RIVER


*** LEGEND ***
□ = SUMMER 1968 AND 1969
⊙ = SUMMER 1970-1972
◁ = SUMMER FROM 1973 - PRESENT
CUMM NSF WATER QUALITY INDEX
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
STATION MILE POINT
0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
343030 RARITAN RIVER S. BRANCH
343093 RARITAN RIVER S. BRANCH
343091 RARITAN RIVER S. BRANCH
343010 RARITAN RIVER S. BRANCH
343059 RARITAN RIVER S. BRANCH
343011 RARITAN RIVER S. BRANCH
343012 RARITAN RIVER S. BRANCH
343092 RARITAN RIVER S. BRANCH
343013 RARITAN RIVER S. BRANCH
343014 RARITAN RIVER (R14)
343015 RARITAN RIVER (R15)
343016 RARITAN RIVER
343017 RARITAN RIVER (R17)
34382+ RARITAN RIVER


*** LEGEND *** . –
□ = WINTER 1968 TO 1969
○ = WINTER 1970-1972
△ = WINTER 1973 TO PRESENT
CUMM NSF WATER QUALITY INDEX
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
STATION MILE POINT
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
343009 RARITAN RIVER S. BRANCH
343053 RARITAN RIVER S. BRANCH
343051 RARITAN RIVER S. BRANCH
343010 RARITAN RIVER S. BRANCH
343069 RARITAN RIVER S. BRANCH
343011 RARITAN RIVER S. BRANCH
343012 RARITAN RIVER S. BRANCH
343052 RARITAN RIVER S. BRANCH
343019 RARITAN RIVER S. BRANCH
343014 RARITAN RIVER (R14)
343016 RARITAN RIVER (R16)
343018 RARITAN RIVER
343017 RARITAN RIVER (R17)
343034 RARITAN RIVER

ACKNOWLEDGEMENTS

Thanks must be extended to Robert Hicke of Systems Architects Inc. for his assistance in the implementation of these programs. Thanks also to Barbara Sue Clark and George Lackowitz of EPA for their assistance in verifying results and refining the qualigram data. The typing was very professionally done by Ms. MaryAnn LaBarbera.

REFERENCES

(1) McClelland, N.I., Water Quality Index Application in the Kansas River Basin, USEPA, Region VII, Kansas City, Missouri. Report No. EPA-907/9-74-001 February 1974

(2) Ashbrook, J.D. and Sande, S., A User's Guide to the Integrated Plotting Package, National Institutes of Health, D.H.E.W., Bethesda, Maryland March 1975

(3) User's Manual for EPA Scientific Applications Software, MIDSD, Washington, D.C. July 1975

(4) Greeley, R.S., Johnson, A. et al, Water Quality Indices MITRE Corporation, Washington, D.C. 1972

(5) Effect of Geographical Location on Cooling Pond Requirements and Performance, pp. 146-234, USEPA, Water Quality Office, Washington, D.C. Report No. 16130FDQ03/71, March 1971

Appendix A

DIGITIZED UNIT QUALIGRAMS USED BY COMPUTER PROGRAMS

WATER QUALITY INDEX

DISSOLVED OXYGEN

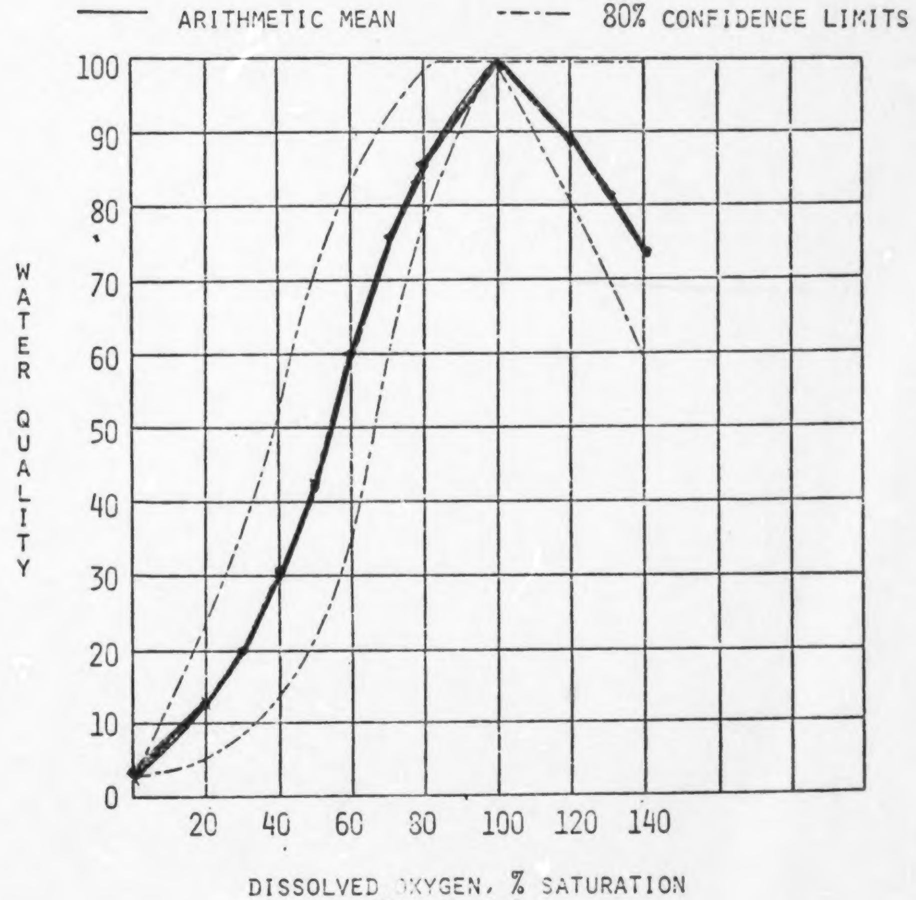


Figure A-1

W = 0.17

NOTE:
FOR D.O. >140% SAT,
$q_i = 50$.

WATER QUALITY INDEX

FECAL COLIFORMS

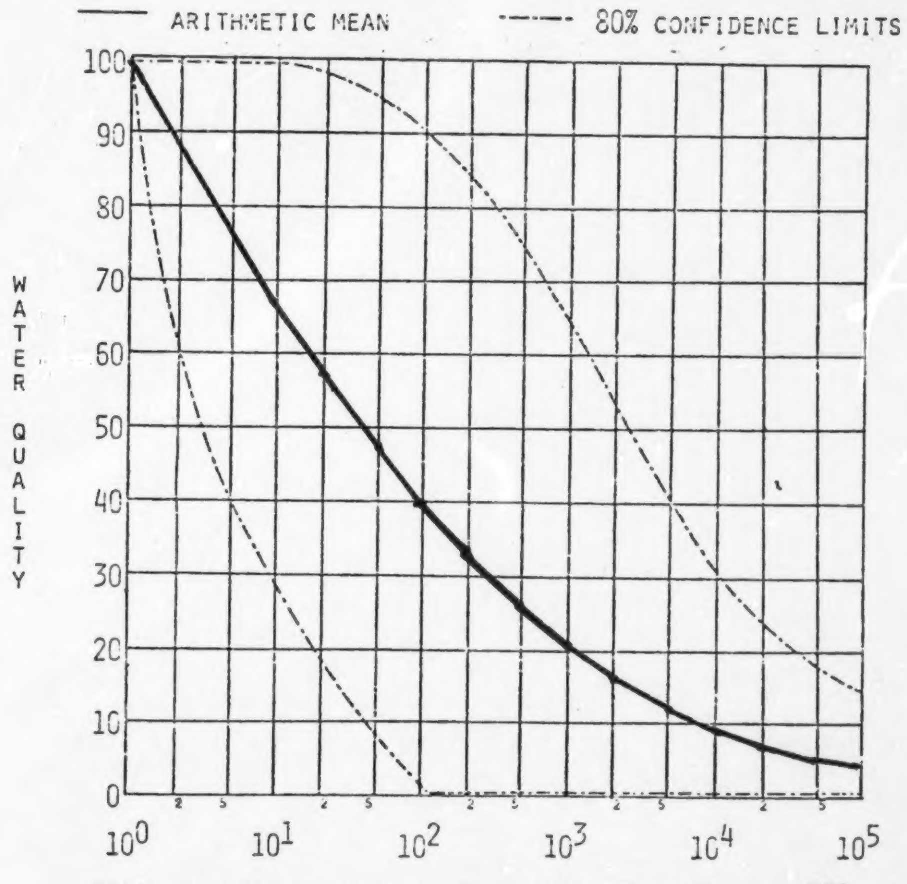
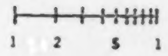


Figure A-2

w = 0.15



KEY FOR LOG SCALE
INTERPOLATION

NOTE:
FOR F.C. >10(5)/100ML
q_i = 2.

WATER QUALITY INDEX

pH

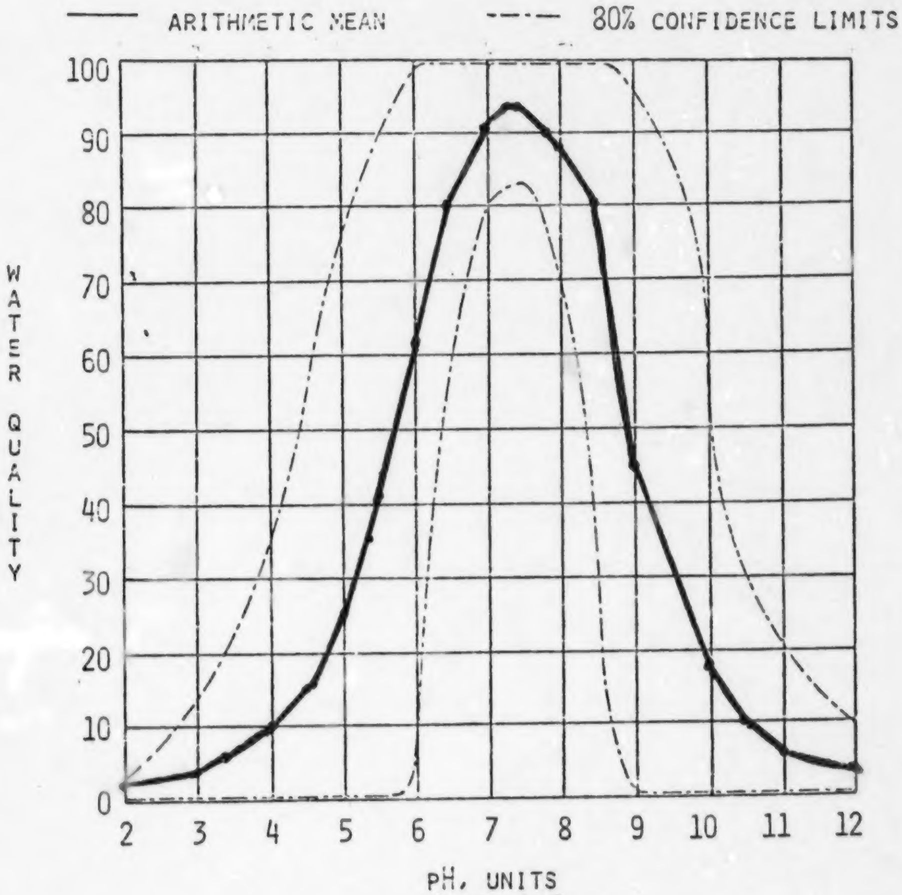


Figure A-3

w = 0.12

WATER QUALITY INDEX

BOD5

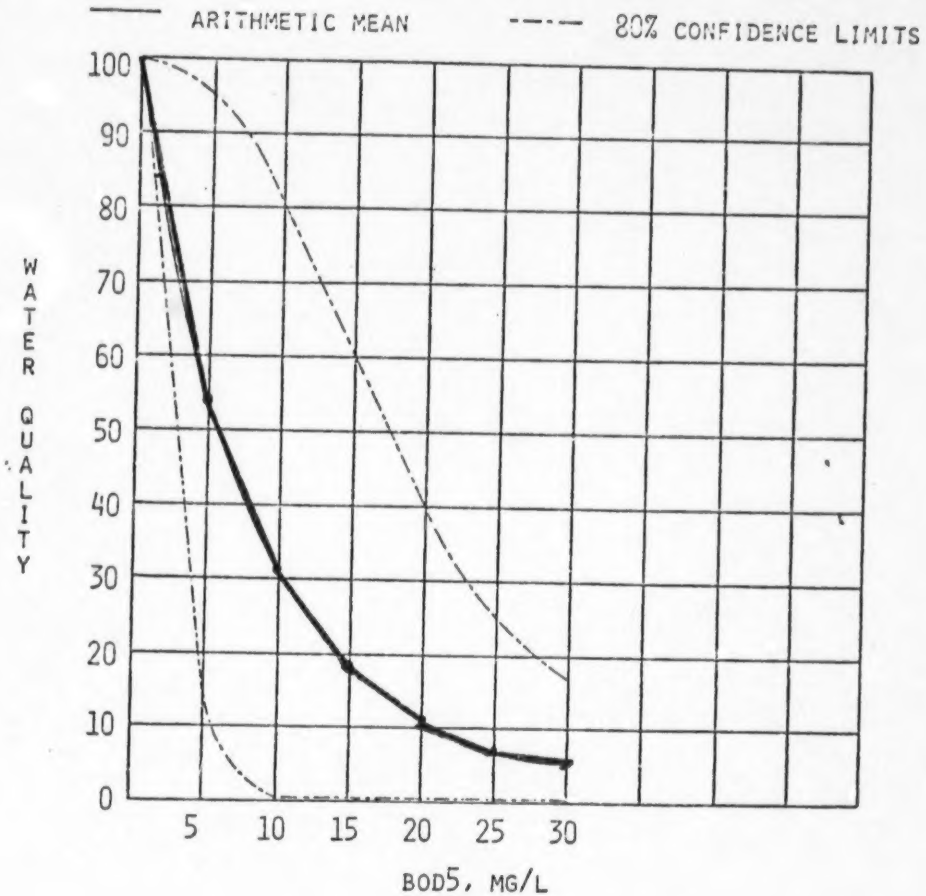


Figure A-4

W = 0.10

NOTE:
FOR $BOD_5 > 30$,
$q_i = 2$.

WATER QUALITY INDEX

NITRATES

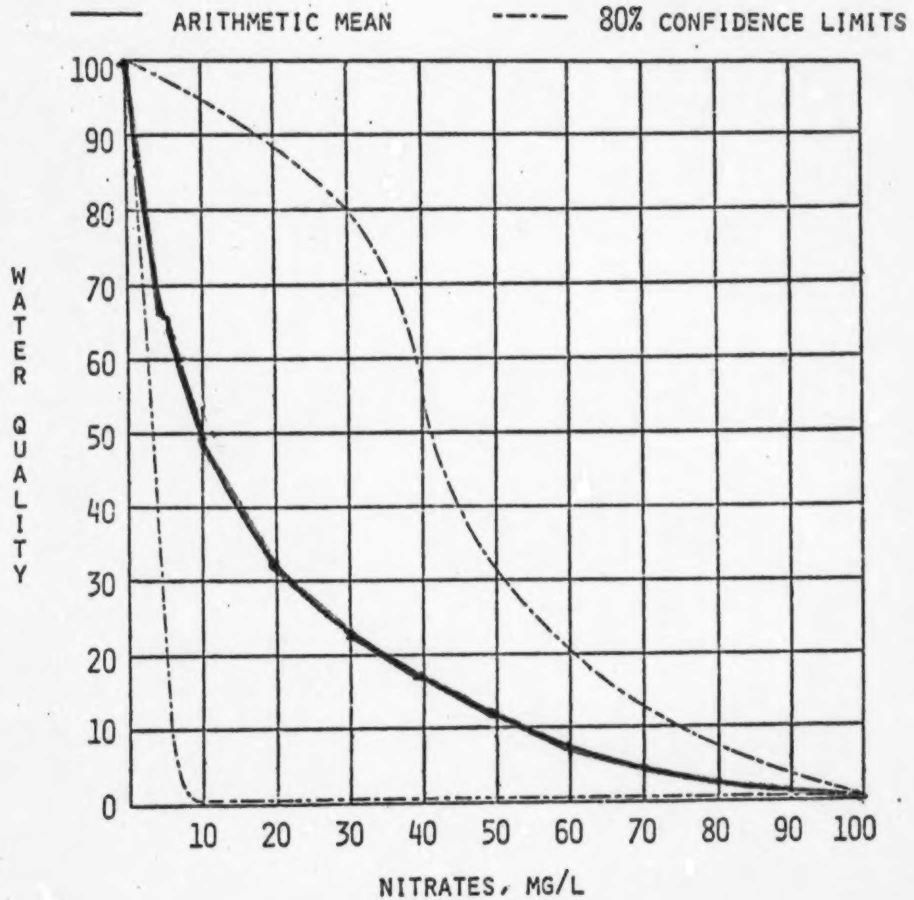


Figure A-5

W = 0.10

NOTE:
FOR NITRATES >100 MG/L
$q_i = 1.$

WATER QUALITY INDEX

TOTAL PHOSPHATES

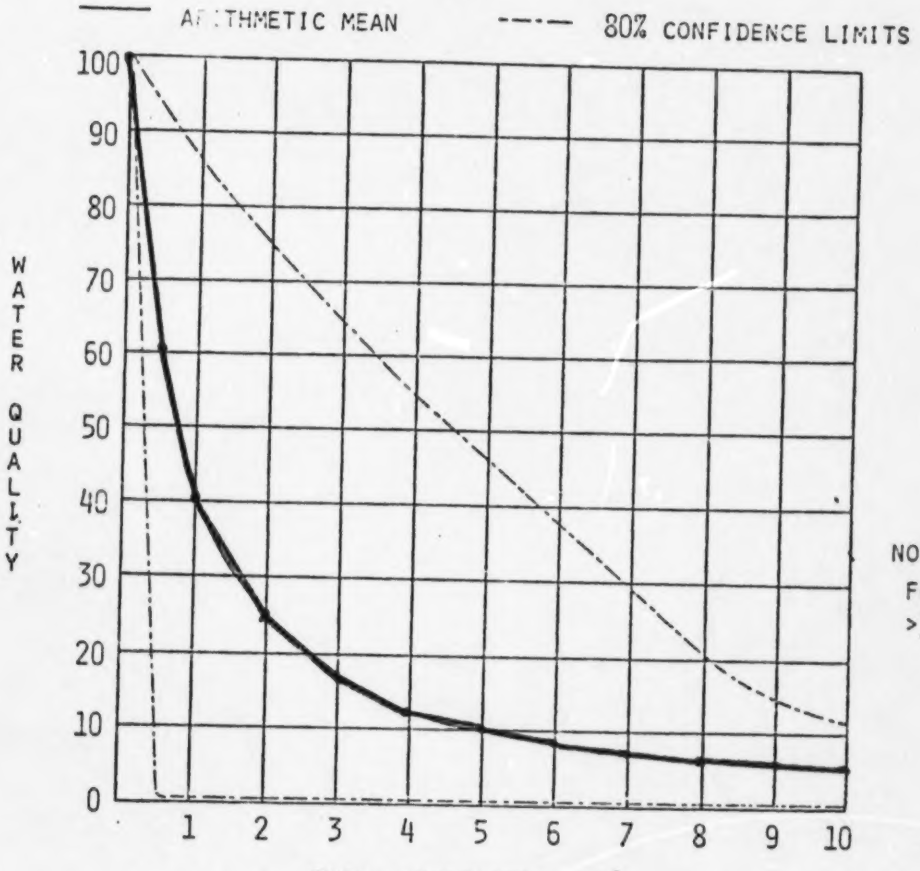


Figure A-6

w = 0.10

NOTE:
FOR TOTAL PHOSPHATES
>10 MG/L, q_i = 2.

WATER QUALITY INDEX

TEMPERATURE

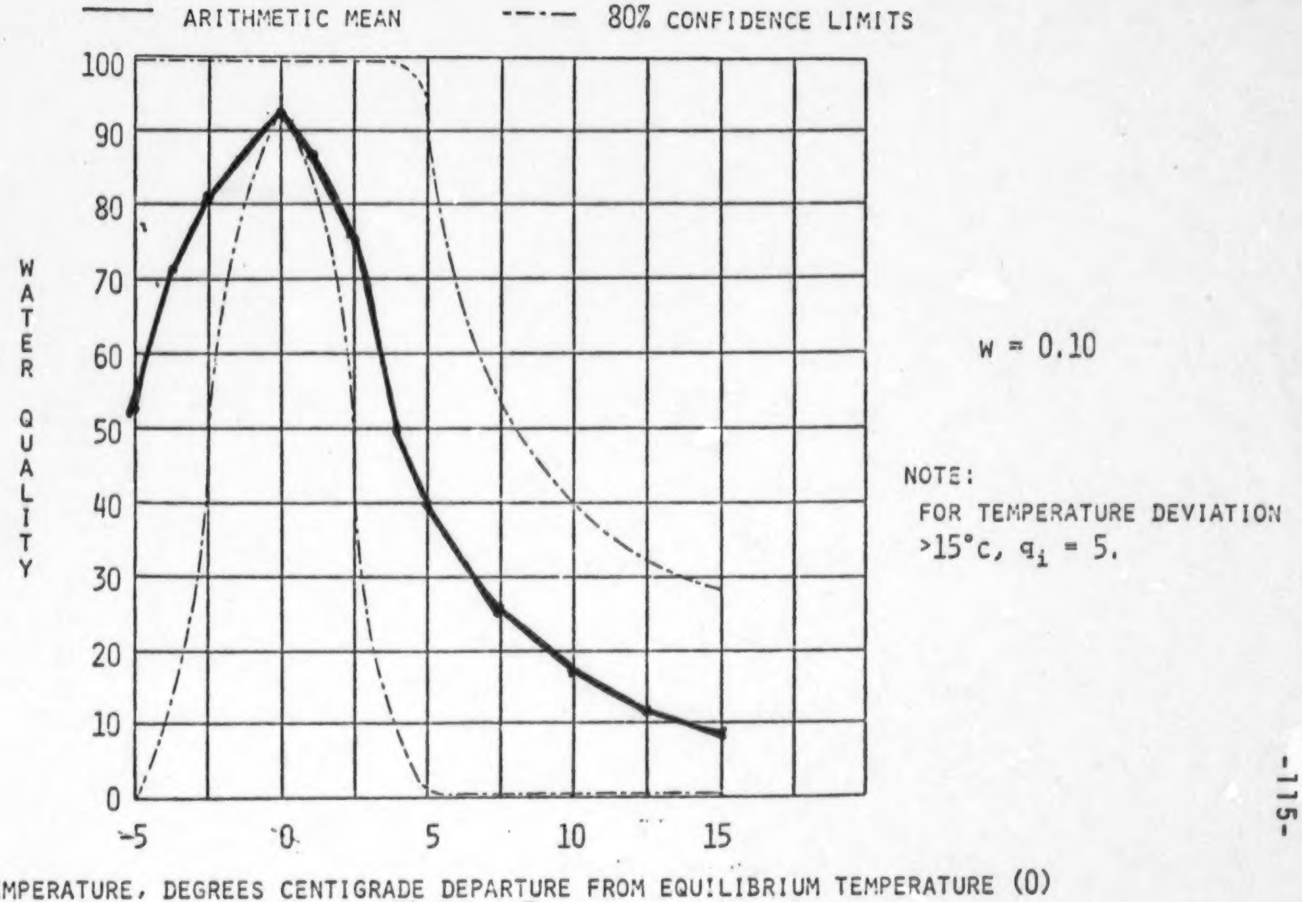
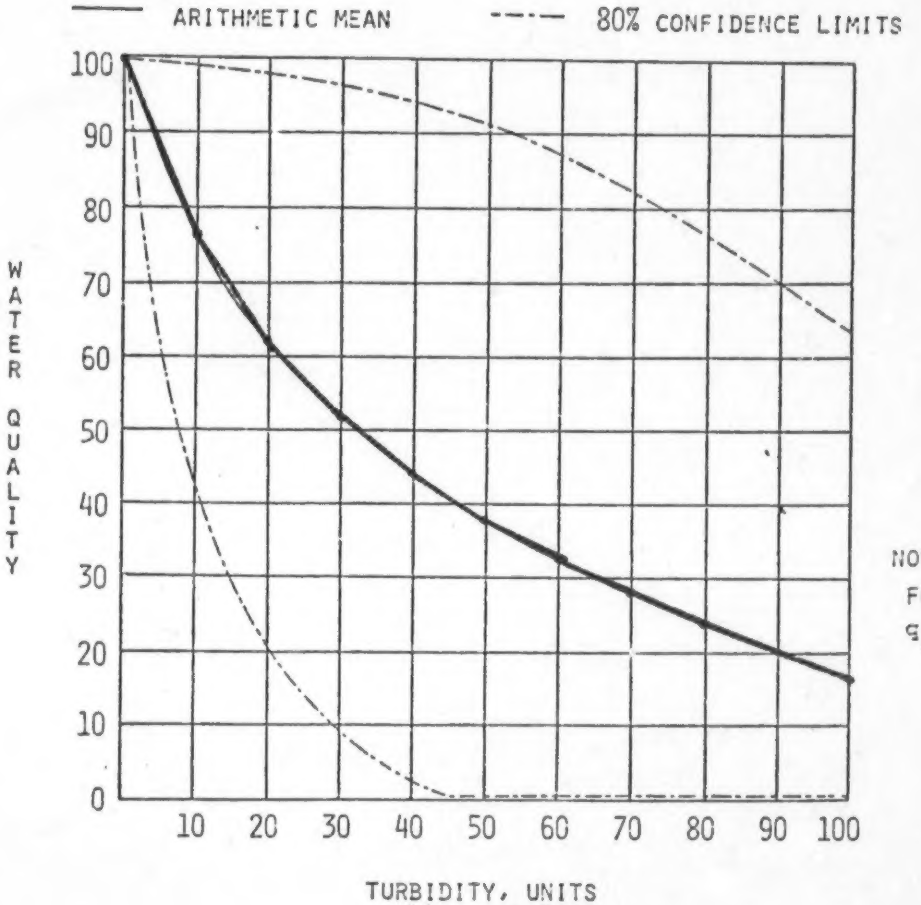


Figure A-7

WATER QUALITY INDEX

TURBIDITY



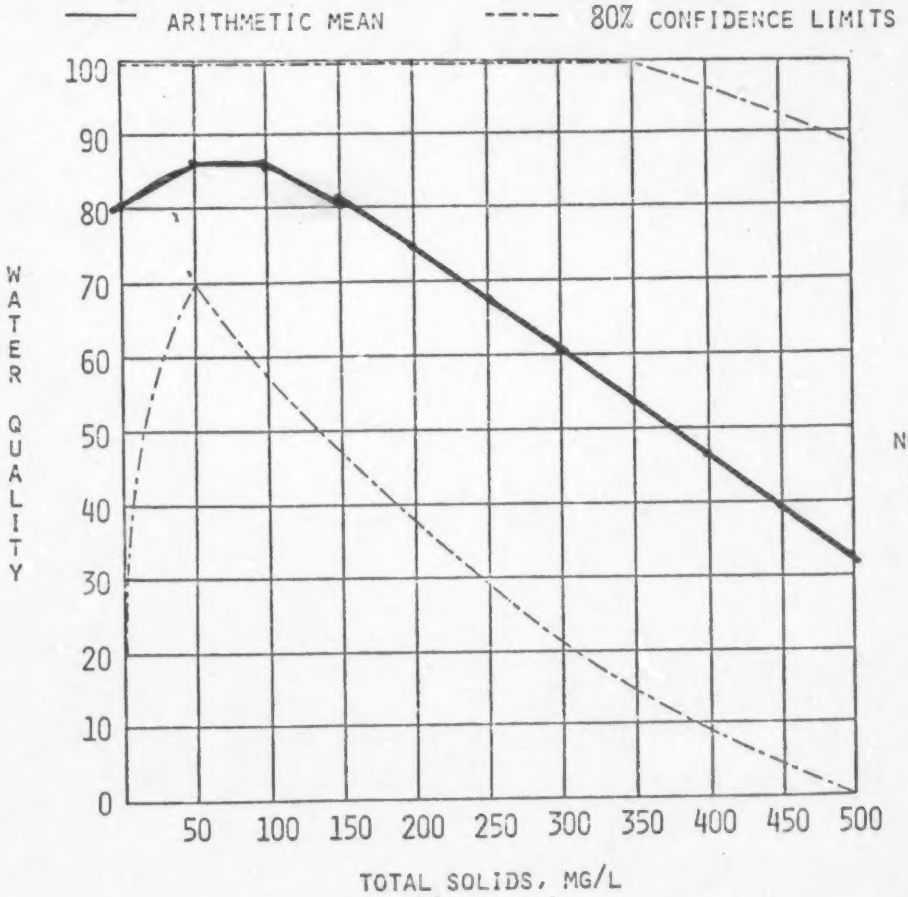
W = 0.08

NOTE:
FOR TURBIDITY >100 JTU
$q_i = 5.$

Figure A-8

WATER QUALITY INDEX

TOTAL SOLIDS



W = 0.08

NOTE:
FOR TOTAL SOLIDS
>500 MG/L, q_i = 20.

Figure A-9

AN APPLICATION OF IPP (George A. Nossa, Management Division, EPA, Region II)

In enhancing the capabilities of the States and EPA water quality planning staffs we found it desirable to interface the STORET System with a generalized plotting software and produce plots in a more flexible manner than presently available.

Water quality planning requirements clearly demand a means of reducing water quality data volume, but enough detail must be kept so that meaningful trend analyses are possible. To achieve this end we have developed three computer programs to:

- Compute and plot the NSF Water Quality Index (WQI) in a set of Storet Stations for a desired period of record
- Display five separate water quality parameter plots in a page
- Display seasonal WQI for several stations in a basin using station numbers or their relative distances in the stream as one of the coordinates

The graphics are produced by use of the Integrated Plotting Package.

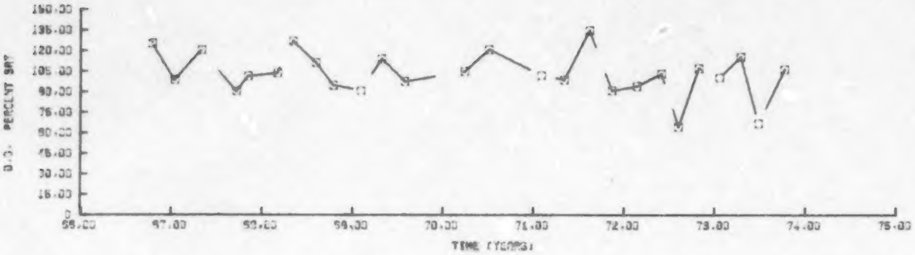
This plotting package differs from other software such as Calcomp in that plotting instructions are not coded. The user merely enters his specifications and then calls a subroutine which performs all the plotting functions.

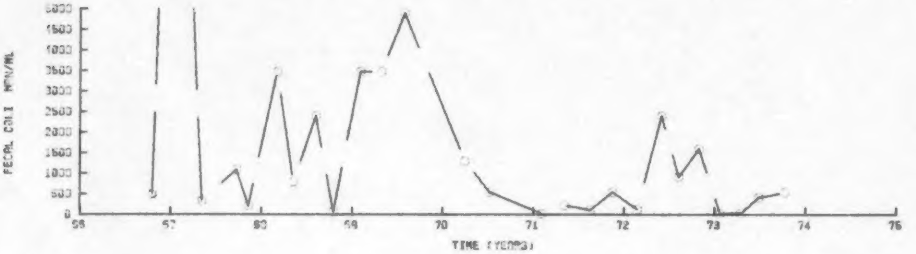
Very early in our applications, we learned that IPP was a very flexible, user oriented package with virtually none of the limitations found in similar software. The package has two separate sets of programs, the first allows for a Fortran programmer, with no experience in computer plotting, to generate basic graphics from day one. The second set of programs has many more options allowing the user to be more involved with the final results.

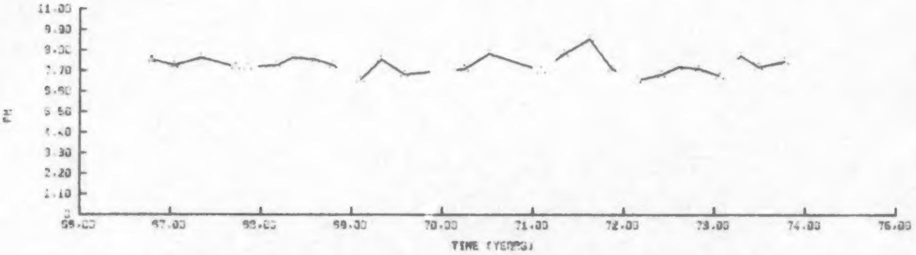
Besides its ease of use and reliability, this Plotting Package also has a very flexible mode of output, which allows for printer plots, calcomp digital plots or interactive tektronics output by simply changing a few JCL statements.

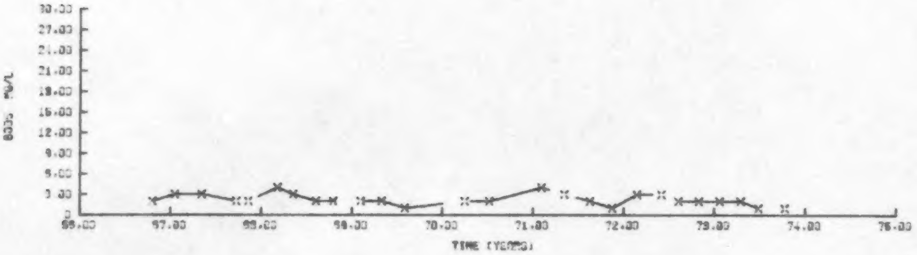
This Plotting Package is highly recommended to new users of graphics output and also for applications where programming resources are limited. Interested users are referred to the EPA Scientific Applications Software Manual published by MIDSD for an Overview of IPP. A document has been prepared on the use of IPP for the water quality management programs mentioned previously, including a test case of the Raritan Basin. Any readers interested in obtaining these should contact Laura Livingston or George Nossa at FTS 264-9850.

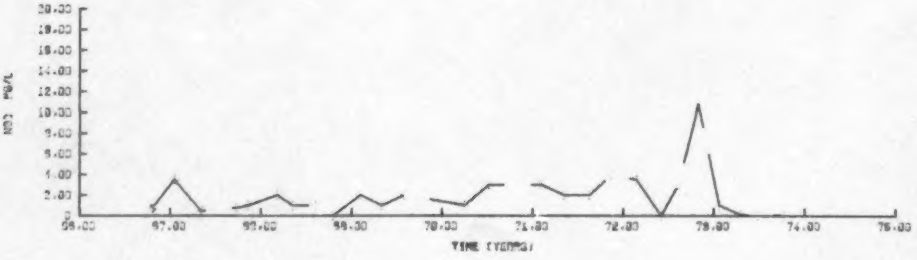
STORET STATION NO. 343013 RARITAN RIVER S. BRANCH











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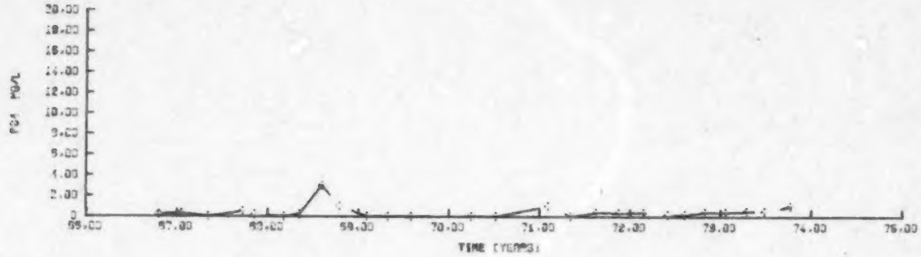

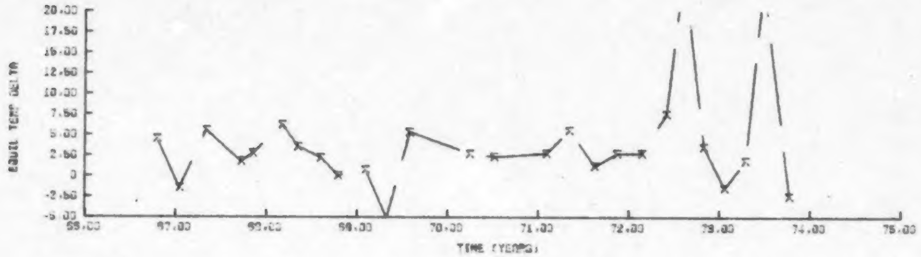

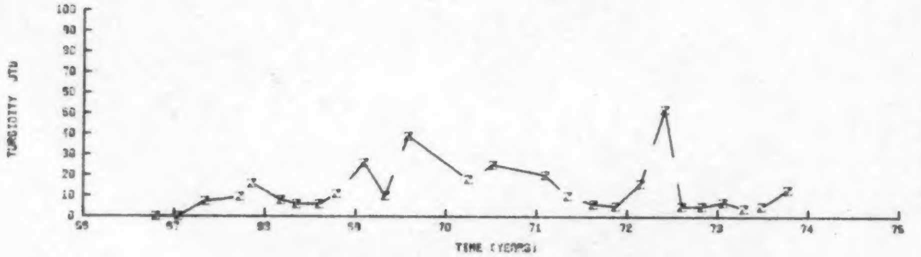

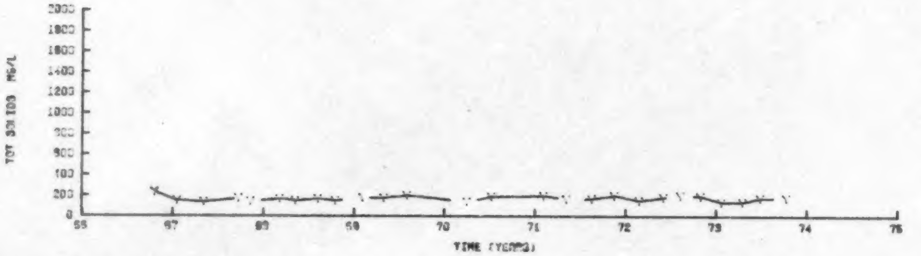

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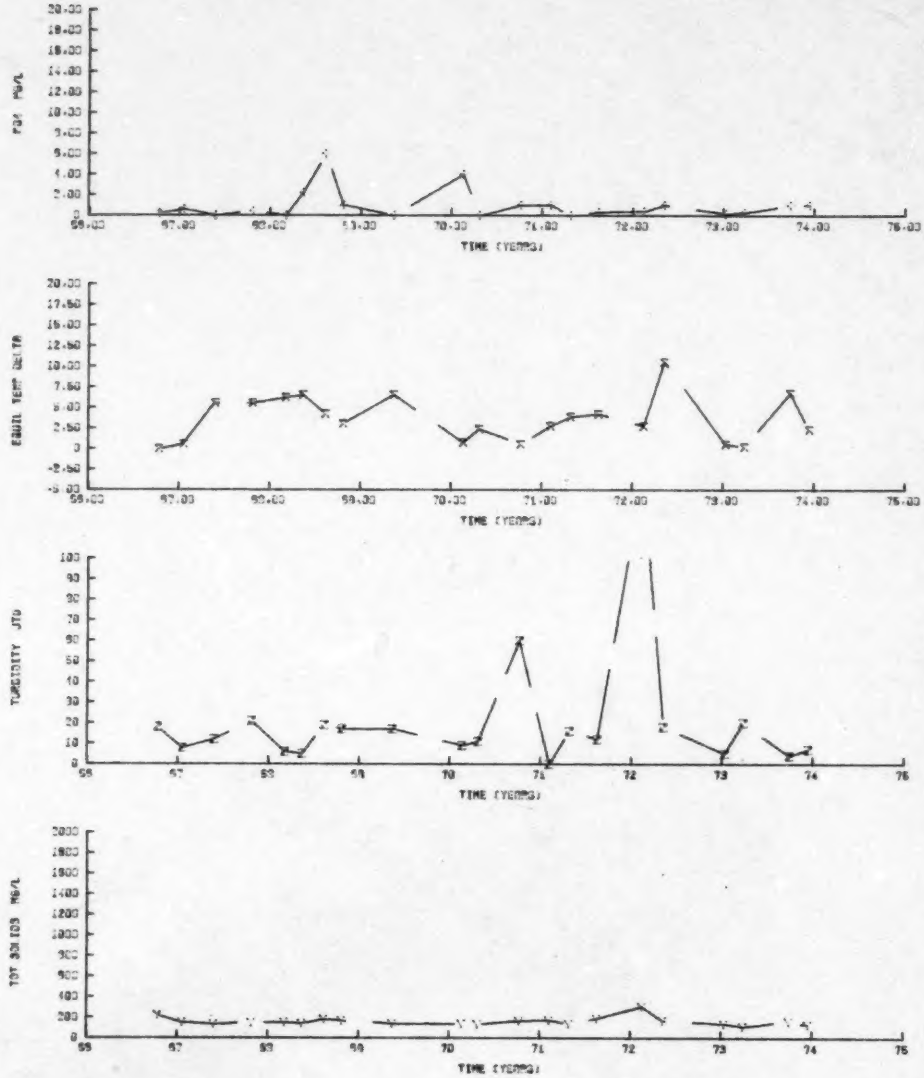

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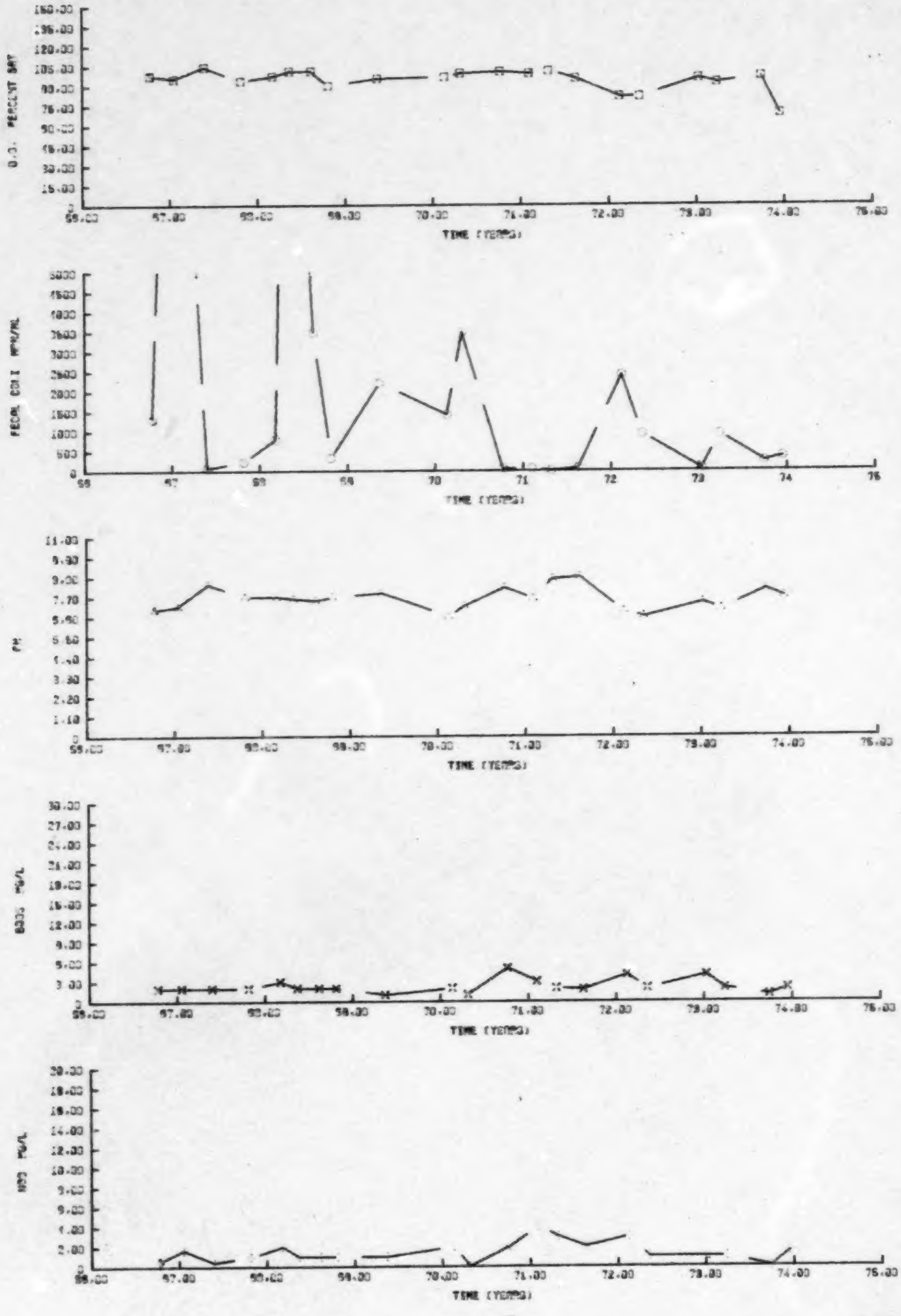

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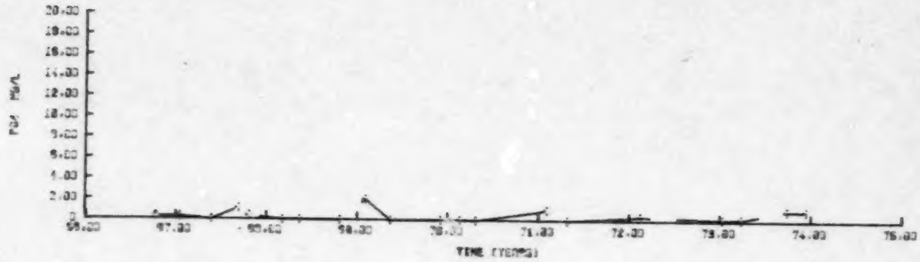

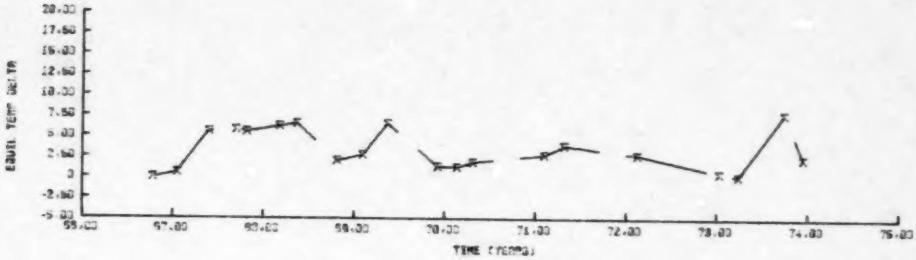

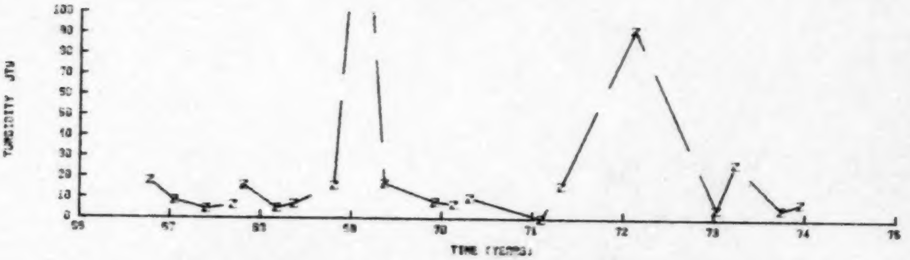

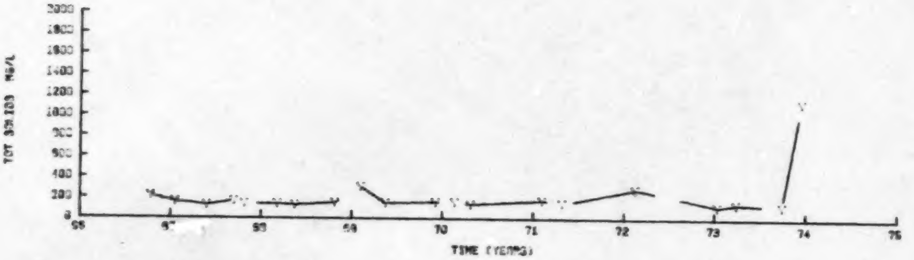

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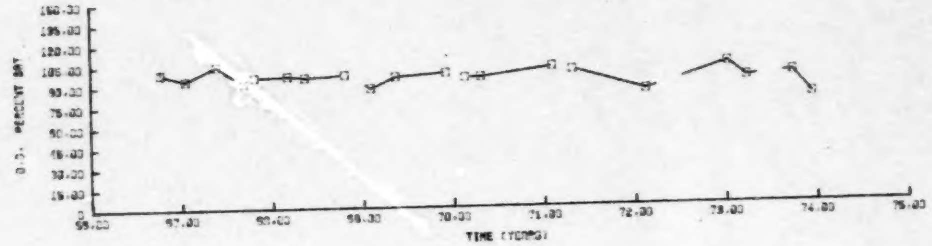

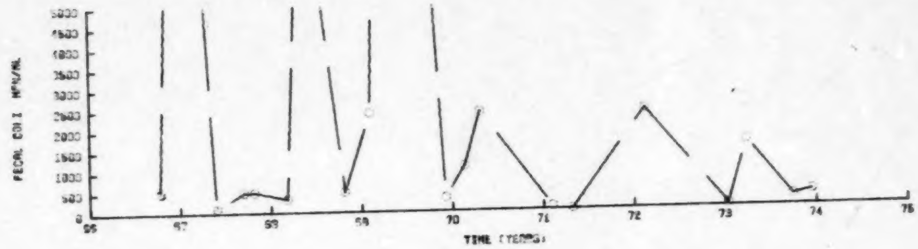

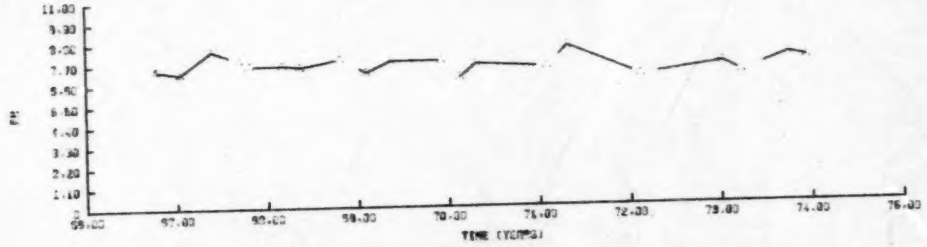

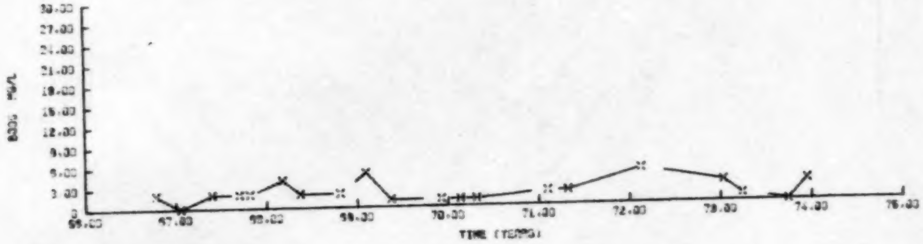

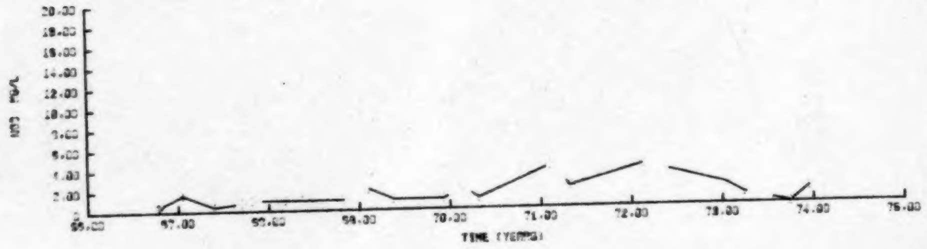

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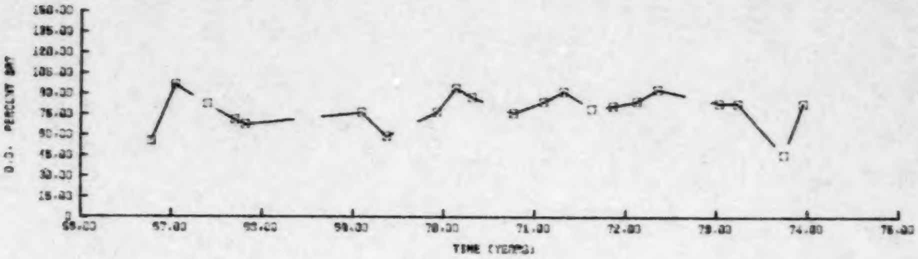

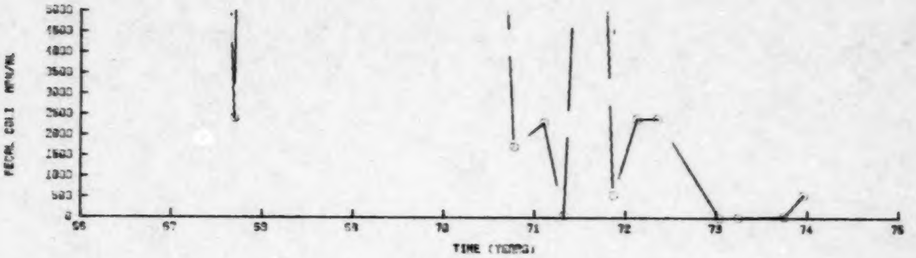

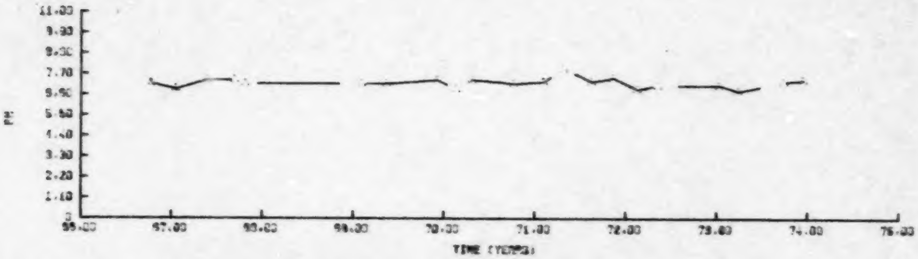

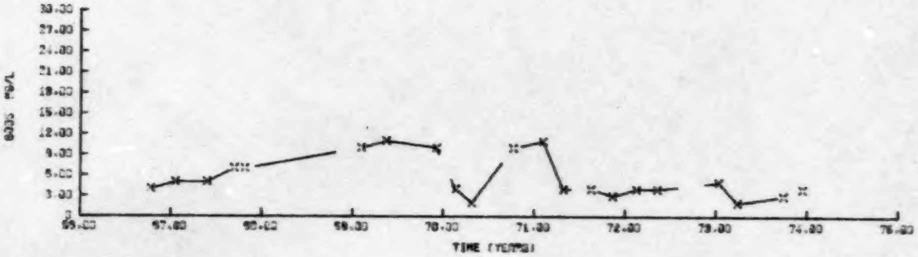

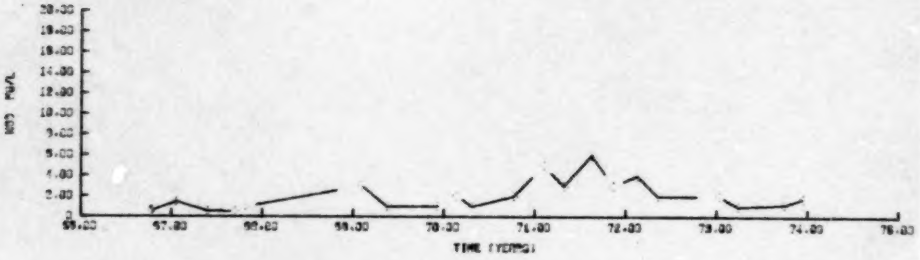

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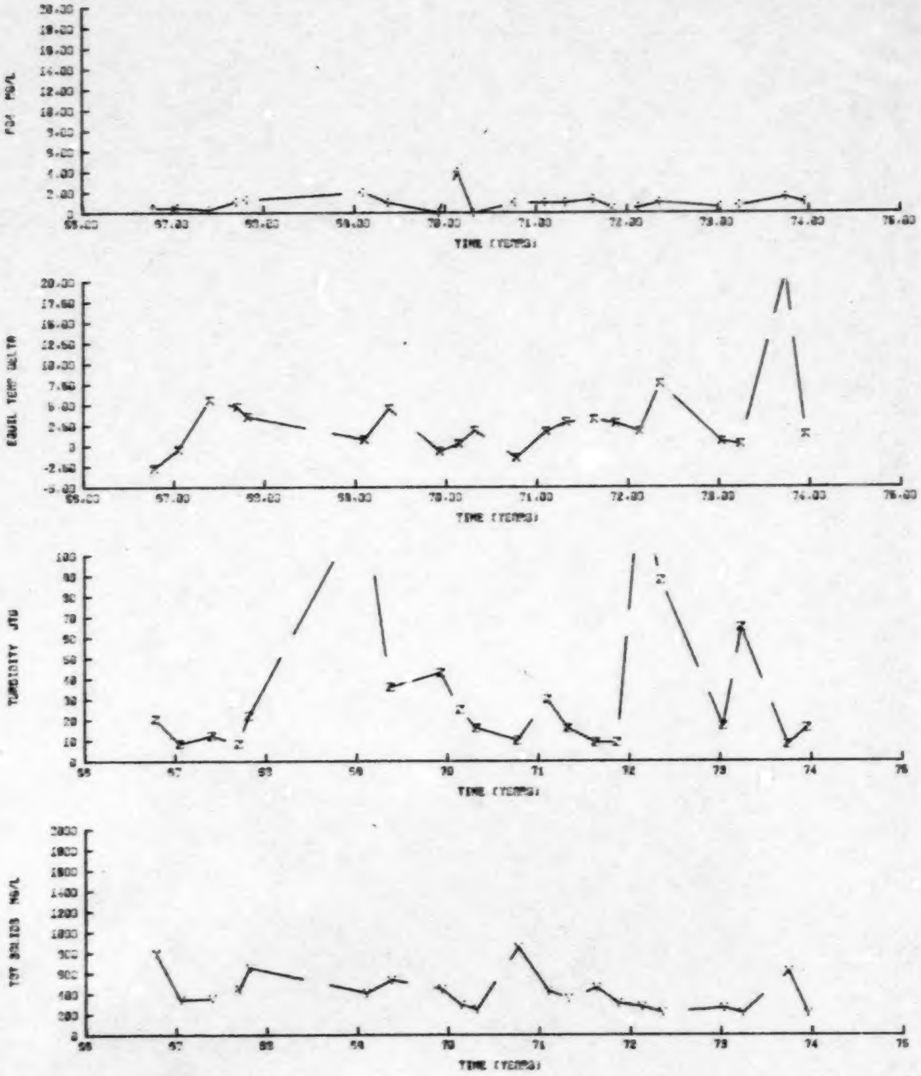

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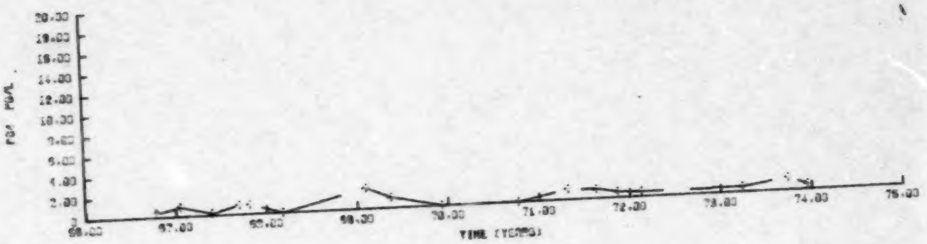

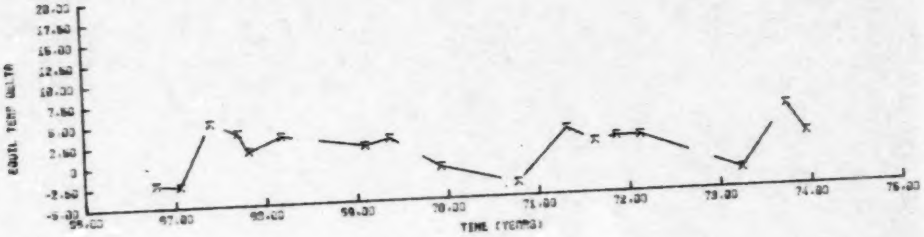

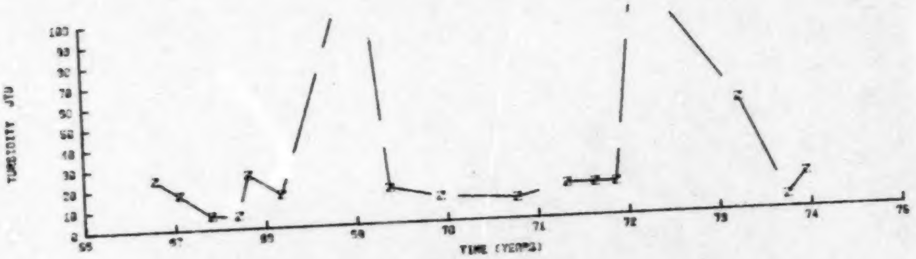

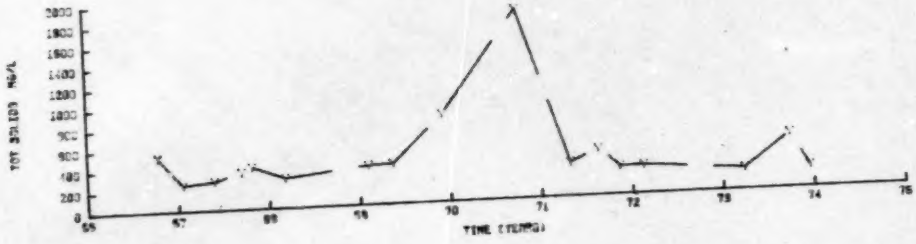

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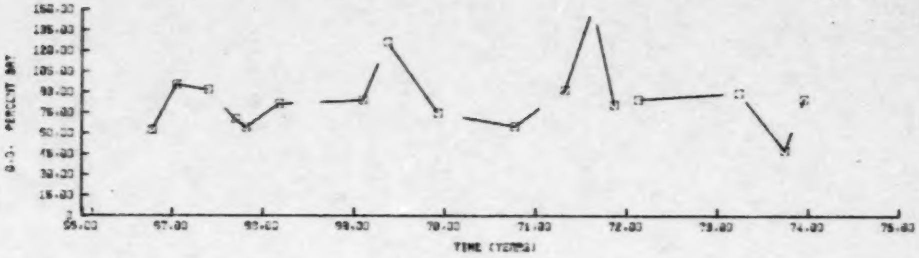

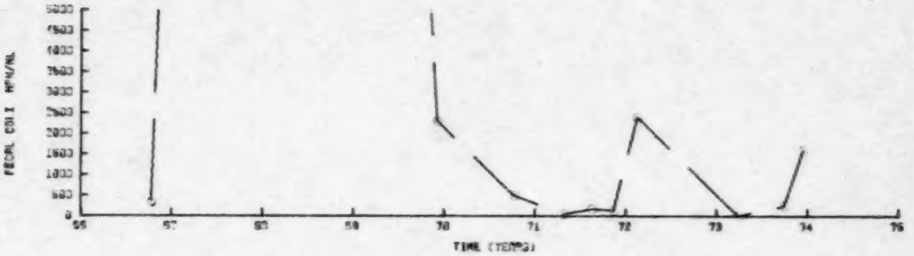

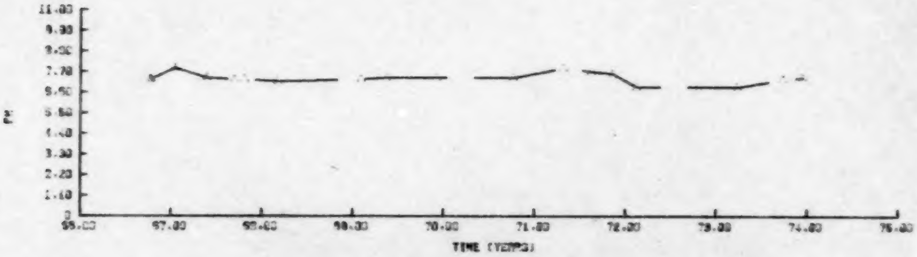

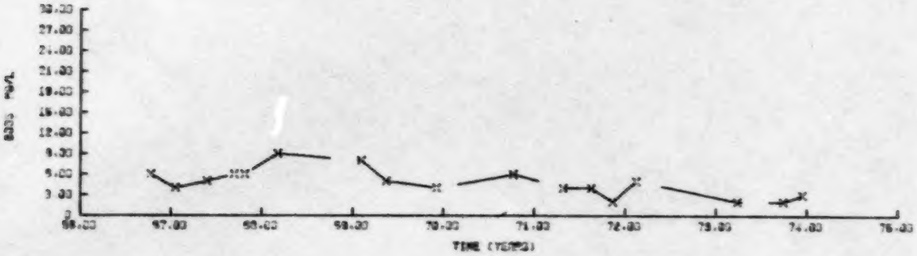

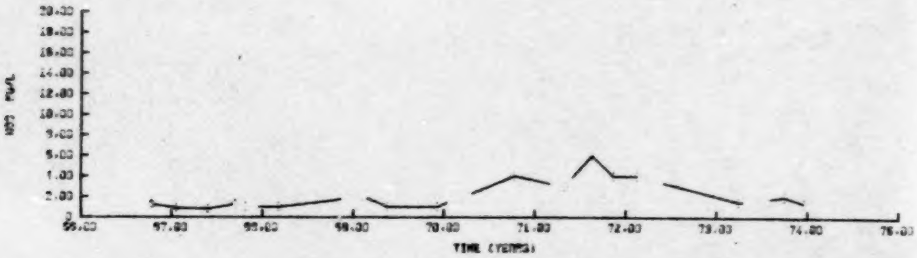

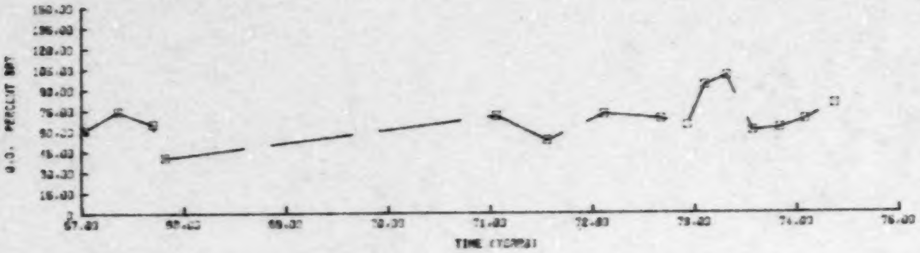

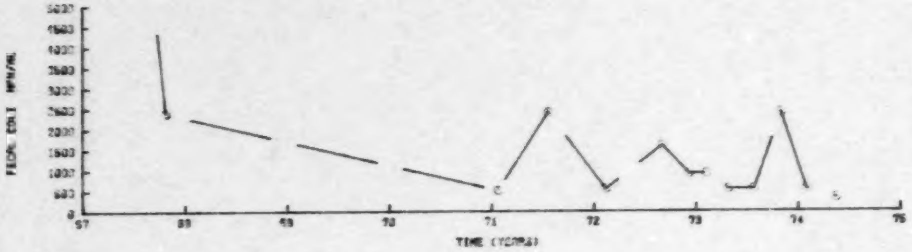

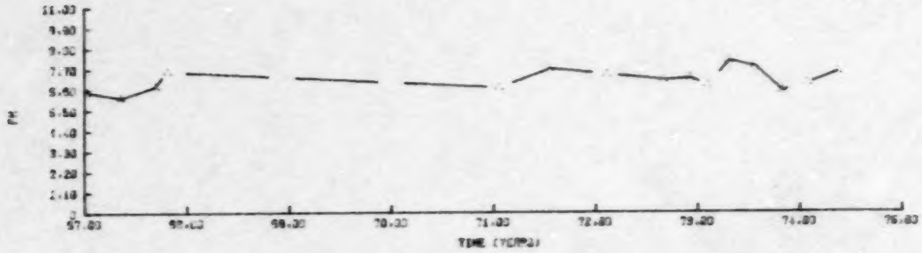

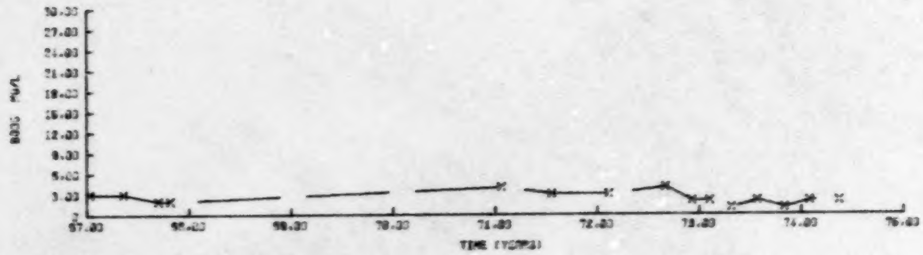

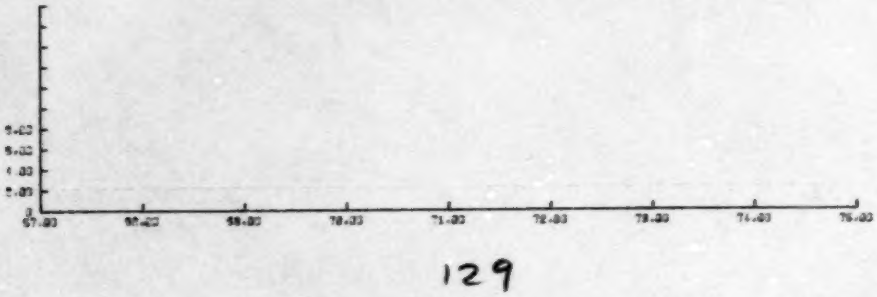

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